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ANURIA FOLLOWING TRANSFUSION 733
FREDERIC W. BANCROFT, M.D. ..... NEW YORK, N.Y.
THE EFFECT OF THE ADMINISTRATION OF IODINE UPON EXOPHTHALMIC GOITRE 749
ARNOLD S. JACKSON, M.D. ..... MADISON, WIS.
NEW THORACOPLASTIC PROCEDURE FOR PULMONARY TUBERCULOSIS TO LESSEN INCIDENCE OF POST-OPERATIVE PNEUMONIA 748
JOHN ALEXANDER, M.D. ..... SARANAC LAKE, N.Y.
SUTURE OF STAB WOUND OF THE HEART 757
ROBERT L. RHODES, M.D. ..... AUGUSTA, GA.
CHOLECYSTECTOMY; EXTERNAL AND INTERNAL CHOLECYSTOSTOMY 761
JOHN B. DEAVER, M.D. ..... PHILADELPHIA, PA.
SYPHILIS OF THE STOMACH 767
JOHN A. HARTWELL, M.D. ..... NEW YORK, N.Y.
DUODENO-JEJUNOSTOMY 791
HENRY F. GRAHAM, M.D. AND PEDRO PLATOU, M.D. ..... BROOKLYN, N.Y.
ENTERO-MESENTERIC CYSTS 795
THOMAS A. SHALLOW, M.D. ..... PHILADELPHIA, PA.
TUBERCULOMA OF THE CÆCUM 801
FREDERICK C. HERRICK, M.D. ..... CLEVELAND, OHIO
OVARIAN DERMOIDS 821
JOHN D. KOUCKY, M.D. ..... ROCHESTER, MINN.
THE SUTURE OF THE APONEUROSIS OF THE INTERNAL OBLIQUE MUSCLE TO THE LIGAMENT OF POUPART 833
GEORGE W. ROBERTS, M.D. AND KINGSLEY ROBERTS, M.D. ..... NEW YORK, N.Y.
STRICTURE OF THE URETER 839
WINFIELD SCOTT PUGH, M.D. ..... NEW YORK, N.Y.
XANTHOSARCOMA OF THUMB 851
VINCENT VERMOOTEN, M.D. ..... NEW HAVEN, CONN.
KIENBÖCH'S DISEASE OF THE SEMILUNAR BONE 857
RALPH GOLDSMITH, M.D. ..... PHILADELPHIA, PA.
MICROSCOPIC EXAMINATION OF FRESH TISSUE 863
LOUIS B. WILSON, M.D. ..... ROCHESTER, MINN.
TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY 869
STATED MEETING HELD DECEMBER 10, 1924
TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY 876
STATED MEETING HELD JANUARY 5, 1925
CORRESPONDENCE: *Barlow:* Actinomycosis of the Tongue. *Connell:* Complete Posterior Dislocation of Ankle. *LaRoque:* Lipoma of the Inguinal Canal. *Penhallow:* Anomaly of Testis 881
BOOK REVIEWS: *Silvestrini:* Surgery of the Spleen. *Patel:* Traité d'Orthopedie. *Pauchet:* Practical Surgery, Illustrated. *McFarland:* Surgical Pathology. *Evans:* Diseases of the Breast 887

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ANNALS of SURGERY

VOL. LXXXI APRIL, 1925 No. 4

ANURIA FOLLOWING TRANSFUSION*

EFFECT OF DECAPSULATION OF BOTH KIDNEYS

BY FREDERIC W. BANCROFT, M.D.
OF NEW YORK, N.Y.

WE HAVE been led to believe that transfusion is a relatively safe procedure. Many authors report chills following transfusion roughly in about one out of five cases, but rarely do serious complications occur. Kidney complications are exceedingly rare following transfusion. Occasionally a hæmoglobinuria occurs, but there are very few case reports in the literature of acute suppression. The following case is reported because the anuria persisted for a period of nine days with a total secretion during this time of only 35 ounces. As a last resort, having used every therapeutic aid that we knew of, a double decapsulation of the kidneys was performed. This was followed by immediate relief of symptoms; the urine output gradually increased until 50 ounces in 24 hours was passed on the fifth day post-operative.

CASE.—Mrs. R. D., age, forty-nine years. Was first seen by me April 10, 1924. At that time her chief complaint was uterine bleeding and general weakness.

Past History.—Patient had suffered the usual diseases of childhood, but otherwise had been always healthy. Marital history—Four children, normal deliveries, first seventeen years, last eight years. No miscarriages.

Present Illness.—Last period came two weeks late. She has been flowing now for ten days.

Physical Examination.—Anemic rather small thin woman, who does not appear acutely ill. General examination, negative; pelvic, uterus slightly enlarged, second degree retroversion. Hager sign suggestive.

Patient was advised to go to the hospital for curettage for diagnosis. This, however, she refused to do and I did not see her again until two weeks later when she was admitted to the Private Patients' Pavillion of the New York Hospital. She was markedly anemic and had been flowing since last seen. Her main complaint was extreme weakness. At that time her red blood count was 2,800,000. Hæmoglobin 45 per cent. White blood count 12,000, Polymorphonuclears 78 per cent.

It was thought advisable to first transfuse her and then do a rapid curettage for diagnosis under gas and oxygen anæsthesia. The blood of the donor, who was a healthy young man, a personal friend, was grouped by the laboratory of the New York Hospital. There was no agglutination or hæmolysis of the cells of either donor or recipient by microscopical examination.

Operation.—April 19, 1924. Transfusion by the Unger method; 400 c.c. of blood given. The transfusion went smoothly but during the procedure the patient complained of severe pain in the lumbar region of the back. This, however, was not associated with

* Read before the Southern Surgical Society, December 14, 1924.

any increased pulse or other symptoms. Following the transfusion, a rapid curettage lasting ten minutes under gas and oxygen anæsthesia was performed. A moderate amount of curettings were obtained, which resembled placental tissue rather than malignancy. Uterine cavity was irrigated with hot saline and gauze packing was inserted in the vagina to promote contraction of the uterus.

Pathological Report.—April 24, 1924, by Doctor Elser. *Diagnosis.*—Incomplete abortion. Specimen consists of a small amount of curettings. Microscopic sections show that there is a partially developed decidua. At one point there are two markedly degenerated bodies having the structure of chorionic villi. The glandular changes are also in excess of those encountered in the ordinary menstrual cycle.

Post-operative History.—Following the transfusion the patient had a chill lasting for twenty minutes with an elevation of temperature to 103.4.

The first day post-operative she secreted one ounce and the second day one ounce. The anuria continued for nine days with the highest secretion in any twenty-four hours being six ℥. Analysis of the urine showed a specific gravity of 1010, clear, with a slight trace of albumin.

Her blood count the first day post-operative was, red blood cells, 2,400,000. Hæmoglobin, 40 per cent. White blood cells, 25,000. Polymorphonuclears, 92 per cent.

One the fourth day post-operative, the urea nitrogen of the blood was 64.86 and creatinin 2.29. Three days later the urea nitrogen had risen to 70.84 per 100 c.c. blood serum. Nine days post-operative the serum calcium was 4.8 milograms per 100 c.c. of blood and the carbon dioxide combining power .57 per cent.

During the nine days in which anuria persisted, almost every method we knew was used to aid secretion. Hot irrigations and hot packs were given with hyperdermoclysis. At one time glucose intravenously was administered on the theory that the glucose acts as a diuretic. Her condition gradually became very alarming. She was irrational. Vomiting was almost persistent in spite of frequent gastric lavages. She had numbness in her hands and feet. On the eighth day spastic contractions resembling tetany occurred in both hands and feet. On the ninth day her condition seemed desperate. Her back and legs were markedly œdematous, pulse was rapid and weak. She was irrational. Blood pressure was 100/35.

It was decided then as a last resort to do a decapsulation of both kidneys. This was done under gas and oxygen; the entire operation taking twenty minutes. Both kidneys were rapidly exposed, the capsule split and stripped to the hylum. The parenchyma was grayish in color. Bulging pieces of the kidney were torn off with the capsule. The appearance of the kidney tissue was almost necrotic.

The day following decapsulation the patient secreted 9½ ℥ and this increased every day until the fifth day when she secreted 51. Her mental and general physical condition improved rapidly after decapsulation. On the seventh day following decapsulation, two days after beginning administering soft solids, she developed a suppurative perotitis on the right side. I believe that this condition in her case resembled somewhat the abscess that follows a caked breast. The gland had been inactive for a couple of weeks and with a beginning secretion, the duct was plugged and infection followed. The duct was catheterized and massage instituted. This, however, was unsuccessful and seven days following the onset of the infection, when numerous small abscesses had coalesced, incision and drainage was necessary. This rapidly healed and on discharge of the patient, twenty-nine days post-operative, her condition seemed satisfactory.

She was re-admitted again June 18, three weeks after discharge, complaining of pain, tenderness and a mass in the right upper quadrant. It was difficult to determine whether this mass was due to a hydronephrosis, perinephritic abscess or a secondary abscess in the right lumbar gutter.

June 24 she was cystoscoped by Doctor Lowsley and his report is as follows: Vesical fundus is normal except for few flakes of pus floating in media. Ureteral orifices normal in appearance but deeply placed. Lead catheter No. 6 French passed to the kidney pelvis

on each side without difficulty. The specimens collected were clear from both sides, but there was no continuous flow from the right side; in fact the flow from the left side was more profuse than from the right. These specimens were sent to the laboratory for culture and to Doctor Semsroth for microscopical and chemical examination.

One c.c. of phenol-sulphone-phthalein, injected intravenously, appeared on both sides in five minutes.

Note:

Report of ureteral specimen	Right	Left
Character	Clear	Somewhat cloudy
Urea	Quantity insufficient for examination.	
Phenol-sulphone-phthalein		
Appeared	5 min.	5 min.
Per cent. time	3½% 10 min.	2½% 10 min.
Microscopic examination of sediment		
Wet specimen	Some epith.	Many r.b.c.
	Some r.b.c.	Some epith.
	Few leuk.	Few leuk.

Red Test:

Q

1st appearance 4¾ min. 1st hr.—25%
2nd hr.— 1%

Blood urea—19.32 mg. per 100 c.c.

Cultures of urine show:

Right ureter—Bac. Coli. Communis.
Left ureter —Bac. Coli. Communis.

By X-ray examination, June 25, 1924, the left kidney shadow was plainly made out, normal in position. Right kidney shadow slightly larger than left but the entire right quadrant is more or less opaque in appearance. The catheter extends to kidney pelvis. No evidence of stones anywhere in the urinary tract. As a result of the cystoscopic and X-ray examination we were convinced that the mass was not due to a hydronephrosis and kidney infection *per se*.

June 25 she was taken to the operating room and a small incision made in the former kidney scar. A finger was inserted; no pus escaped. Patient was then turned on her back, right rectus incision made and an abscess cavity in the right lumbar gutter incised and drained. It was felt that this was due to the fact that in the hurried procedure at the time of decapsulation, her peritoneum had been opened. Following this, the patient's convalescence was rapid. The urine report on leaving the hospital was as follows:

Urine report, July 26, 1924.

Volume	SS	Sugar	0
Color	Straw	Acetone	0
Specific gravity	1.014	Diacetic acid	0
Reaction	Acid	Casts	0
Appearance	Clear	Pus	Few
Albumen	0	Blood	0
		Epithelium	Few

Remarks.—Kidney complications following transfusions are rare. They include albuminuria, hæmoglobinuria, oliguria and anuria. In reviewing the literature there seem to be two types of anuria, the first a primary hæmoglobinuria and secondary anuria and the other types, as the case reported, where

there was no evidence of a primary hæmoglobinuria. Eight cases have been reported in the literature of anuria or extreme oliguria following transfusion. Of these, seven were preceded by hæmoglobinuria. One other case besides the author's was due to a primary anuria. It has been assumed that the hæmoglobinuria followed by anuria is due to some foreign protein which breaks down red blood cells and clogs the kidney capillaries. Death occurred in six of the eight cases reported.

Bernheim, in his book published in 1917, states that in one of his cases following transfusion, actual cessation of kidney excretion gradually took place. The patient became prostrated and developed uræmia from which she died. The author is of the opinion that in such cases the kidney tubules are occluded by deposits of hæmoglobin in them, resulting from the excessive hæmolysis.

In 1918, Goormaghtigh reported a case of transfusion in a soldier suffering from hemorrhage and shock. No blood tests were made, as only one donor was available. The patient showed marked improvement after the transfusion, but on the following day was restless, sweated profusely and vomited. The quantity of urine steadily diminished and by the sixth day after transfusion, anuria was complete. The patient died in the afternoon of that day. At no time did the urine show any hæmoglobin or red cells, indicating that the reaction was not due to hæmolysis. At autopsy, an acute tubular nephritis was found. The liver showed marked degenerative changes characteristic of a severe toxæmia; the kidney lesion was also of a type found in toxæmia. The author concludes that the blood of the donor contained some toxin, or for some unexplained reason, was toxic to the recipient.

In 1921, Bowcock reported a case of pernicious anæmia where a severe reaction and oliguria followed the fifteenth transfusion.

Ottenberg and Kaliski in 1913 reported a case of pernicious anæmia in which transfusion was followed by death in eight hours. During this period the patient passed no urine, blood smears showed phagocytosis of red blood cells by polymorphonuclear leucocytes—evidence of injury to or destruction of the red cells.

Miller, in a discussion before the Brooklyn Surgical Society in 1919, reports a case in which symptoms began to develop after 20 c.c. of blood were given; the transfusion was terminated when 60 c.c. had been given, as at that time there was a severe reaction, with puffing of the whole body, especially of the face. In this case there was complete anuria for forty-eight hours; at the end of that time an ounce of urine was obtained that "looked like ink." This patient had marked gastro-intestinal symptoms, with vomiting and diarrhœa; the pulse was rapid and weak; and there was marked prostration and evidence of extreme toxæmia. The condition finally cleared up, but the patient died later from pernicious anæmia. This reaction followed a third transfusion. Two donors had been tested and their blood found to be compatible with the patient's. One donor was used for the first two transfusions; the second for the third transfusion. When the donors' bloods were

tested against each other later, hæmolysis resulted. The author believes the incompatibility of the two donors' bloods was responsible for the reaction in this case, as the last two transfusions were given within a week.[1]

Curtis reports a case in a woman with anæmia due to hemorrhage from a uterine fibroid. Immediately following transfusion, there was an extremely rapid pulse, a chill and some hæmaturia. Only one ounce of urine was passed in the first twenty-four hours post-operative. In the succeeding three days, the patient passed, respectively, three, one and two ounces of urine. The urine showed a trace of albumin and an occasional cast, but was otherwise normal. The blood urea was high, 100 mg. per 100 c.c. The donor's blood was tested with that of the recipient previous to transfusion and found to be compatible. The citrate method was used. The patient gradually recovered from the anuria and other symptoms. The author believes anuria was the result of the transfusion, not of the anæmia, but offers no explanation for the occurrence.[2]

Copher reports a case in which shortly after transfusion, persistent vomiting began with suppression of urine. The anuria was complete for twenty-four hours, then the patient voided 30 c.c. of urine containing a few white and red blood cells, much hæmoglobin and many casts. Death occurred eleven days after transfusion. Previous to transfusion, the blood of the donor and patient had matched perfectly, but at a second test evidence of incompatibility was found.[3]

In 1923, Beraud reported a case of a woman aged twenty-six, in whom a hysterectomy was performed. Following the injection of 280 c.c. of blood, a reaction developed with dyspnœa, pallor, mydriasis and other signs of shock. The transfusion was stopped. The following day the patient's condition was improved, but a hæmoglobinuria developed. By the third day, there was complete anuria, in spite of the use of diuretics. This persisted until the sixth day after transfusion, when decapsulation of the right kidney with nephrostomy was done. The kidney parenchyma at the time of operation was found to be of a violet color, distended and spongy; it bled easily. On the evening of the same day, the urinary flow was reëstablished; the patient was, however, very weak and died two days later. Prior to the transfusion, the bloods of the donor and recipient were tested against each other and showed no agglutination. The test was done hastily, on account of the emergency. Later, a grouping of the bloods showed that the donor belonged to Group I and the patient to Group III. The patient's blood was, therefore, hæmolytic for the donor's cells. The author attributes the hæmoglobinuria and anuria to a toxæmia due to foreign proteins entering the circulation as a result of the hæmolysis and agglutination of the red blood cells injected.

Clough and Clough report a case of "Extreme Oliguria" for forty-eight hours. This patient had been given repeated transfusions for pernicious anæmia. Cases of marked oliguria but no absolute anuria are also reported by Boiden, Bull and Mern.[4]

The capsule stripping operation in nephritis, as first performed by

Harrison in 1896 and later done and published by Edebohls in 1901, has been slow in finding acceptance in the field of nephritis therapy. Numerous theories have been advanced for its rational. It would seem that the most logical theory is that in cases where there is œdema or stasis of the kidney, the stripping of the capsule relieves tension on the parenchyma, and permits the kidney to regain its function.

It has been argued against the operation, that later a scar tissue capsule forms, which may also contract and cause an interstitial nephritis. It is impossible from published reports to judge of the mortality or end results because undoubtedly operations of this type, resulting in mortality, have been performed, but their cases are not reported. Only those cases which have been successful are apt to find their way into literature.

Bessesen in an article in the *American Journal of Surgery* in November, 1924, states that improvement is noted in practically 65 per cent. of the cases, failure of improvement in 20 to 25, and death in 5 to 10 per cent. He concludes that the operation in nephritis is only of temporary relief and this makes it a procedure of necessity rather than of choice.

Conclusions—While anuria is a rare complication following transfusion, it must be considered as a possibility. It is evident that tests of hæmolysis while carefully done are not infallible. It would seem that in desperate cases of anuria, decapsulation is indicated.

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THE EFFECT OF THE ADMINISTRATION OF IODINE UPON EXOPHTHALMIC GOITRE

A STUDY OF SEVENTY CASES THUS TREATED

By Arnold S. Jackson, M.D.
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Section in Surgery, Jackson Clinic

In March, 1922, Plummer first began to use iodine extensively in the treatment of exophthalmic goitre. His results not only revolutionized the treatment of this disease, but swept aside overnight certain theories and principles of therapy that had become generally accepted through many decades of teaching. The idea advanced by Plummer was in utter contradiction to the views of the eminent authorities on goitre, as reference to the literature at once reveals. It is true that numerous workers have in the past reported, as if by chance, the successful abatement of symptoms of hyperthyroidism in certain cases of exophthalmic goitre. Among these observations were those of Trousseau, who as early as 1863, prescribed iodine instead of digitalis through an error, and who later discovered his mistake and also the patient's improvement. Marine at one time believed that iodine was effective in exophthalmic goitre. Hildebrandt experimentally produced symptoms of hyperthyroidism in rats and then caused a return to normal by administering iodine. Unfortunately for science and humanity, however, these investigators failed to follow up their observations with a definite clinical proof in support of their idea.

In October, 1922, I began the treatment of exophthalmic goitre with Lugol's solution (an aqueous solution of 5 per cent. iodine and 10 per cent. potassium iodide) according to Plummer's directions. The idea was not entirely new because, as a former student of his, somewhat similar studies had been observed. In the first twenty patients treated, the following observations were made. There was remarkable clinical improvement in all cases; patients no longer thrashed about in bed and chafed their extremities; the characteristic starey expression disappeared, although exophthalmos persisted. The extreme nervousness accompanied by insomnia subsided, the patients became more quiet and composed. The greatest degree of clinical improvement was noted in the most toxic cases. Thus, in two patients admitted during gastro-intestinal crises, the administration of iodine by rectum, as well as by mouth, caused a cessation of the crises within forty-eight hours, together with a rapid abatement of all toxic symptoms.

In the treatment of these cases, only ten drops of Lugol's solution was administered daily. The length of time of administration and the amount of iodine were dependent on the clinical improvement. It was customary to perform at least one ligation in the more toxic cases, and at first even a multiple stage thyroidectomy was occasionally performed. In spite of

careful preparation, two of the patients in this series had considerable reaction, so that Lugol's solution was given post-operatively. One of these patients appeared to be in a serious condition, and so with some hesitancy it was decided to administer large doses of iodine. The effect was so immediate and striking that the dosage administered to all patients was at once increased. Since that time there have been fifty patients with exophthalmic goitre operated upon with no sign of hyperthyroidism following operation. In fact, there has been but slight difference in the post-operative reactions of cases of simple adenoma and exophthalmic goitre. The last twenty-five patients have been subjected to a primary thyroidectomy without even a preliminary ligation.

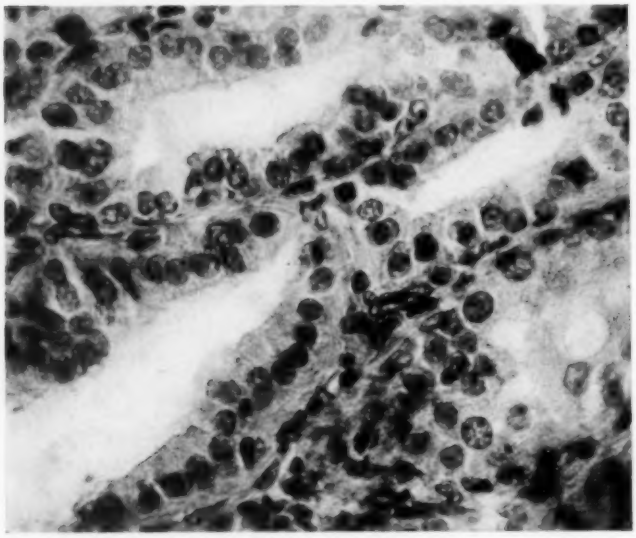

FIG. 1.—Exophthalmic goitre. Parenchymatous hypertrophy showing columnar cells. This patient received Lugol's solution for six months and persistently showed a clinically low grade hyperthyroidism. While the major portion of the gland shows reversion to colloid, areas of hyperplasia, as this, still persist. (X 600.)

The reason for the remarkably beneficial effort of iodine in exophthalmic goitre has not been definitely determined. Plummer's hypothesis, however, will undoubtedly receive general recognition. Whether the thyroid gland is producing an excess of normal secretion or whether it is secreting an incomplete product remains to be determined. The idea that the gland is being overstimulated through exhaustion of thyroxin in the tissue and that it is putting forth an incomplete secretion, seems most logical to me. We may then explain the beneficial effect of Lugol's solution on the theory that it puts the gland at rest and allows it to complete its normal secretion.

Technic of Administration.—The stay of patients in the hospital has now been reduced to a minimum, and they may be prepared for operation at home or in a quiet hotel. This includes patients who are able to walk about, have no cardiac decompensation, and are not severely hyperthyroid. All patients are subjected to a careful general physical examination, including examination of the vocal cords, renal function, and a study of the basal metabolism. Patients who have not suffered a marked loss in weight, have only a slight quadriceps weakness, and a basal metabolic rate not exceeding +75 per cent. are put on the following regimen. Ten drops of Lugol's solution is given before meals for three days and likewise thirty drops of

tincture of digitalis. Patients are advised to rest most of the time, to eat heartily and to take fluids freely. Luminol, gr. 1½, is given daily at five o'clock. At the end of three days if sufficient improvement is indicated, the patient is sent to the hospital, where ten drops of Lugol's solution is given every hour for five hours. The following morning thyroidectomy is performed under the morphine-scopolamine-novocain method of anæsthesia. On returning to the room ten drops of Lugols' solution is administered at once by proctoclysis, and two hours later another dose is administered by mouth. Usually fifty drops are given in the first twenty-four hours, and thirty drops the following day. The dosage is varied, depending upon the speed of recovery.

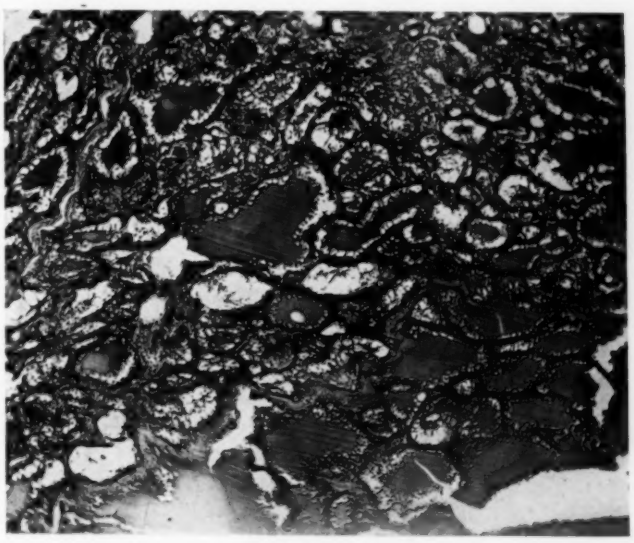

FIG. 2.—Tendency of colloid to replace areas of hyperplasia; the latter, however, are not completely displaced. (X 60.)

This brief period of preparation has sufficed in the majority of cases. The fact that our patients spend, as a rule, only five days in the hospital is in marked contrast to the former methods of treatment where the period of preparation and convalescence often extended over an interval of weeks.

Patients who have suffered a loss of forty or fifty pounds in weight, have a marked quadriceps loss, a basal metabolic rate in excess of +75 per cent., diarrhœa or vomiting, and those who in any way indicate that they may be approaching a crisis, require a longer and more careful period of preparation. Twenty drops of Lugol's solution is administered daily to these patients. They are given absolute rest in bed for two or three days and then are allowed to be up and about two hours or longer daily in order that they may not grow weak from inactivity. A forced diet of at least 4500 calories per twenty-four hours is given. Luminol, gr. 1½, is administered twice a day to unduly nervous patients. Absolute quiet and relief from any mental strain are essential. Digitalis is prescribed until any cardiac decompensation is overcome. Even these patients may be treated at home and after a period of from one to three weeks, depending upon the severity of the case, there is usually such a marked general improvement that thyroidectomy may be performed with comparatively slight risk. If there is any doubt, a single ligation should be performed as a test.

Effect of Lugol's Solution on Metabolism.—We are constantly learning more about the effect of Lugol's solution on the basal metabolic rate. In the first series of twenty cases studied there was found to be an average reduction of twenty points in a period of a week or ten days. For the past year we have been able to obtain this reduction in metabolism in half this time in many instances by increasing the amount of the solution. When iodine has been continued in larger amounts over longer periods of time, we have not infrequently noticed a drop of as much as fifty points or more.

In no instance have we been able to bring the basal metabolic rate to normal and keep it there by the continued administration of iodine. In the hope that a reversion of the hyperplastic gland to colloid might take place, a few patients have been kept on iodine for six months, but a low grade hyperthyroidism always persisted, the metabolic rate averaging between 15 and 20 per cent. Lest permanent cardiac or renal damage should be produced by continuing this treatment, these patients were subjected to thyroidectomy, following which there was always a rapid clinical improvement and return to normal. It has seemed that in these cases a certain tolerance to iodine was developed so that its efficacy was somewhat diminished.

FIG. 3.—Exophthalmic goitre. Under the influence of iodine the gland tends to assume a more normal appearance. Colloid is replacing areas of hyperplasia. This patient received iodine for only six days. (X 150.)

While I have only had an opportunity of studying the effect of iodine in four cases of recurrent exophthalmic goitre, I have been surprised with the remarkable results in these cases. Two of these patients were my own cases and two were operated upon elsewhere. In one case the basal metabolism was reduced from +74 per cent. to +15 per cent. accompanied by a gain in weight of 30 pounds. This patient is apparently well. While the other patients have not shown such striking improvement, they have improved enough to obviate the necessity for surgery at least for the present.

Symptomatic Improvement.—More remarkable than the effect on the basal metabolic rate is the improvement in the clinical condition of the patient. Within forty-eight hours, the extreme restlessness, nervousness, and emotional irritability so typical of these cases begin to disappear. We no longer witness the distressing sight of large, full-grown men crying like

babies. We miss the typical spectacle of the patient picking and fingering the bed clothes, the restless thrashing about from one side of the bed to the other, and the continual shifting of the extremities. On throwing back the bed clothes we see that the elbows and knees are not red and chafed as formerly. Even more remarkable is the facial expression. Exophthalmos persists until after operation, but the anxious, frightened, staring expression is replaced by one of quiet composure and assurance.

There is an immediate and steady gain in weight and we are now frequently confronted with the unusual sight of stout people with exophthalmic goitre. One patient in this series was an eighteen-year-old girl who weighed 125 pounds. Due to family illness her operation was delayed four weeks, and during this time her metabolic rate dropped from +54 per cent. to +18 per cent. and she gained twenty pounds in weight.

FIG. 4.—Exophthalmic goitre in an eighteen-year-old girl. Operation was unavoidably delayed a month; during this time the basal metabolic rate was reduced from +54 per cent. to +18 per cent., and the patient gained 20 pounds on Lugol's solution.

This brings up a new problem in the question of diagnosis that we have heretofore not encountered and concerning which I believe no mention has been made. Owing to the remarkable results that have followed the use of iodine in cases of exophthalmic goitre, physicians all over the country have been anxious to experiment with it. In their eagerness to benefit the patient, some physicians have failed clearly to establish a diagnosis before starting treatment. Thus, the number of cases of iodine hyperthyroidism in patients with adenomatous goitres has shown a startling increase in the past few months. I have had two patients who lost more than fifty pounds from this distressing condition in two months time. These cases, however, are simple to diagnose.

Patients with incipient cases of exophthalmic goitre who have received just enough iodine effectively to mask their condition, offer the difficult problem

for the diagnostician. This new aspect of the clinical syndrome of exophthalmic goitre is characterized by but few diagnostic leads. We are confused by patients who are normal in weight or even obese, who are not nervous or restless, whose pulse may be but slightly increased, and whose thyroid is only slightly enlarged. Thrills and bruits may be absent, there is no quadriceps weakness; the skin may be warm and moist, and the eyes fail to betray the true condition. Even the basal metabolic rate may be of little help on a first reading, as we do not attach great significance to a rate less than +20 per cent. in the absence of other corroboratory clinical findings. In the few patients I have examined thus far, however, I have found that the pulse pressure continues to be high. Moreover, after an interval of two weeks with no medication, the basal metabolic rate either remains stationary or is increased, indicating the case to be one of incipient exophthalmic goitre. During this interval the symptoms of hyperthyroidism increase sufficiently to justify a clinical diagnosis.

FIG. 5.—Same patient one month after operation. She is clinically cured and has gained 10 more pounds; the basal metabolic rate is +8 per cent.

Iodine has a noticeable effect on the cardiac action and by noting the charts one can see that the pulse rate falls coincidently with the metabolic rate. The visible pulsation of the blood-vessels so characteristic of exophthalmic goitre, as well as the throbbing of the abdominal aorta so annoying to patients at night, is markedly decreased. The tremor of the fingers persists but to a lesser degree. Insomnia is no longer a factor and two or three nights after commencing treatment patients enjoy a comparatively normal sleep. There is a rapid gain in strength; I have seen patients who have been bedridden for months able to walk around after a week's therapy. In many instances there is considerable decrease in the pulse pressure, the diastolic pressure especially

shows a tendency to rise. In some cases the thrill and bruit become less marked.

Most remarkable of all is the effect of Lugol's solution on patients who are seen for the first time in a crisis. Formerly, this condition resisted all known therapeutic measures and I have many times seen patients lose as much as fifty pounds in a few weeks through persistent vomiting and diarrhœa. I have likewise seen many patients fail to survive a crisis who could have been saved through the use of iodine. Within forty-eight hours after receiving iodine the gastro-intestinal crisis in these cases is controlled and the patients are on the road to recovery. Moreover, the greatest dread of the surgeon, post-operative hyperthyroidism, has been entirely eliminated. It is almost two years since I have seen a case of this type. Now patients are able to sit up and are served a light diet tray on the day following operation.

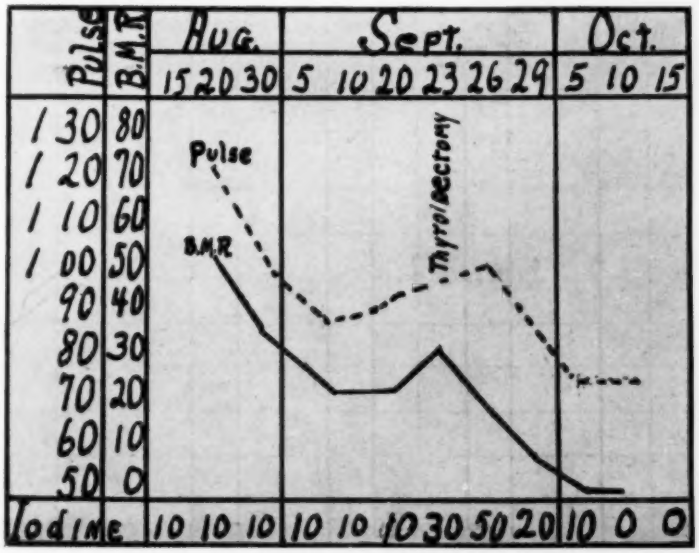

FIG. 6.—(Case 31443). Effect of long-continued administration of iodine in a case of exophthalmic goitre in which operation was unavoidably delayed. While there was a rapid reduction in the rate, it soon became constant at about +20 per cent. with a continued low grade hyperthyroidism.

None of my patients have been operated upon in bed; they have all been perfectly aware of the time of operation and with four exceptions they have received nothing but the morphine-scopolamine-novocain anæsthesia. The majority of patients are out of bed on the third or fourth day and may leave the hospital on the fifth day. In considering these favorable results, the fact must not be lost sight of that these patients are rarely in the operating room for more than forty minutes, and that from the time they enter until they leave the hospital they are under the care of nurses and physicians thoroughly familiar with all phases of goitre work. The numerous little individual contributions of the assistants in handling these patients, teamwork developed by constant repetition, is an important factor in the successful outcome of operation.

Effect of Iodine on Surgical Treatment.—Under present methods of treatment patients are not brought to the operating room in a precarious condition, and we are not confronted with the possibility of having to perform a multiple stage thyroidectomy, merely contenting ourselves with a lobectomy for fear of

losing the patient on the table. Patients enter and leave the operating room with a remarkable degree of self-assurance. The operation itself is technically much simpler and quicker, because we no longer encounter the vascular and friable type of gland that developed through the establishment of a collateral circulation following ligation of the main thyroid vessel. In itself, this is a factor of great financial and mental saving to the patient.

The necessity of having first one ligation and then another several days apart was a matter of considerable expense and discomfort, not to speak of the

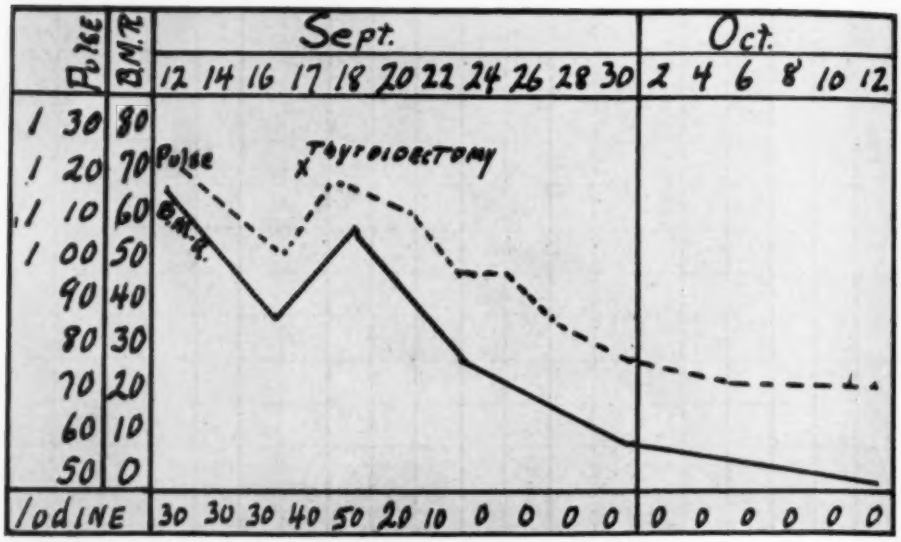

FIG. 7.—(Case 41877). The average reduction in the metabolic rate is +20 per cent. after five days of pre-operative preparation with large doses of iodine. Three weeks after operation the rate in this case was +2 per cent.

delay of waiting several months and the suspense before having the goitre removed. The use of iodine has practically eliminated the necessity for ligation in all save the most toxic cases or in those in which marked visceral changes have occurred. While the operation of ligation of one of the superior thyroid vessels undoubtedly was responsible for saving many lives, yet at best it had many disadvantages. The majority of patients complain of more actual pain from ligation than from thyroidectomy. This is undoubtedly due to crushing of the sympathetic nerve that accompanies the vessel. A noted French surgeon more than a hundred years ago suggested placing the first artery clamps on the side of the vessel nearest to the brain, so that only one sensation of pain might be transmitted to the cerebrum. Patients who had experienced a ligation were often unduly apprehensive of the thyroidectomy.

Recently, a young woman came to me to have her goitre removed. Although ligations had been performed for her by one of the leading surgeons in this work, she refused to return to him because of the great pain she had experienced. In this instance, as in many others, I observed that there had been a failure to ligate one of the superior thyroids vessels. This operation may be technically very simple or very difficult, especially if the vessels are

anomalously located. There are many cases in which merely ligating the superior pole, rather than actually exposing and ligating the vessel, has resulted in failure to obtain the desired results. Finally, the fact that ligation scars are somewhat disfiguring and objectionable even at best, is reason why we may rejoice in being able to discontinue this operation.

Effect of Iodine on the Pathological Picture.—When I first began a pathological study of the thyroid glands removed after the use of iodine preoperatively, I was greatly chagrined. It appeared that my clinical diagnosis had been incorrect and that the tissue removed was largely colloid. Further study led to the conclusion that a transitory change occurs, colloid replacing areas of hyperplasia and the gland tending to assume a normal appearance. As a result of this, one might conclude that in time a complete transitory change would occur and that a medical cure would be effected. This, unfortunately, is not the case, for after some weeks there is developed a tolerance to iodine and its efficacy is diminished. Although I have administered iodine in some cases for as long as six months, there has at all times been a persistent low-grade hyperthyroidism which showed no signs of abating. A study of the microphotographs reveals large areas of colloid replacing the hyperplasia, but this change has never been complete even in the cases that have been under treatment for months.

NEW THORACOPLASTIC PROCEDURE FOR PULMONARY TUBERCULOSIS TO LESSEN INCIDENCE OF POST-OPERATIVE PNEUMONIA

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Introduction.—Paravertebral thoracoplasty is now firmly established as the most valuable known treatment for severe, or moderately severe, predominantly unilateral pulmonary tuberculosis which artificial pneumothorax and prolonged strict sanatorium régime have failed to cure. Under such conditions death from tuberculosis is almost inevitable if operation is not performed.

Recently I [1] have collected 1024 cases, operated upon from 1918 to 1923. The results are as follows: Apparently cured, 32 per cent.; improved, 26 per cent.; worse, no change, under treatment or result unknown, 11 per cent.; deaths directly or indirectly connected with operation, usually within six weeks, 12 per cent.; deaths not connected with operation, mostly from tuberculosis in the unoperated lung, 19 per cent.

The principal causes of death connected with operation are tuberculous pneumonia of either the compressed or uncompressed lung, wound infection and heart failure. The incidence of pneumonia following thoracoplasty is far greater than after other major operations in general surgery. This paper considers the reasons for this and a method of prevention.

Incidence of Tuberculous Pneumonia Following Thoracoplasty.—The only large series of cases in which the complete thoracoplasty operation was completed or begun, and in which sufficient details are given for a study of the causes of death, are those of Stöcklin [18] (Schreiber's Clinic at Davos) and Brunner [7] (Sauerbruch's Clinic at Münich). Twenty-four of Stöcklin's ninety-six patients died of causes more or less directly connected with operation; six of them (25 per cent. of the operative deaths) developed "aspiration pneumonia" and died from five to fifty-three days after operation. Brunner reports twelve deaths directly or indirectly connected with operation among ninety-nine patients. Tuberculous pneumonia was either the sole cause, or one of the gravest of several causes, of operative death in ten (83 per cent.) of the twelve cases.

Thoracoplasty with and without Primary Resection of Lower Ribs.—Relatively little attention has been paid to the cause and prevention of pneumonia following thoracoplasty. Wilms,[19] who proposed the paravertebral operation for tuberculosis, at first preferred to resect only the upper seven or eight ribs, over the principal tuberculous lesions, as he considered it important to preserve the lower chest intact to carry on its expectorating function in order to prevent stasis pneumonia. For this reason Lambert and Miller [12]

have recently reversed the modern standard procedure of resecting the ribs over the lower and less diseased lobe at the first stage of a two-stage operation. They resect the upper five ribs first and several weeks later, when the severe upper lobe lesions have been emptied of their infectious secretions and when there is less danger of pneumonia from insufficiency of the expectorating mechanism, they complete the operation by resecting the lower ribs.

Sauerbruch [14] took issue with the practice of Wilms and stated that the danger of aspiration pneumonia is especially great after thoracoplasty upon only the upper ribs. For twelve years he has uncompromisingly insisted upon resection of the lower ribs before the upper ones in order to compress the lower lobe and eliminate its inspiratory function and thereby to prevent aspiration of infected material that is pressed out of the cavities, ulcers and bronchi of the upper lobe at the time it is compressed. Because Sauerbruch's experience with the surgery of pulmonary tuberculosis is far greater than anyone's else and because the modern thoracoplasty operation used everywhere bears his name, his opinion as to matters of technic is accepted as law by most surgeons.

Primary Thoracoplasty upon the Lower Ribs Favors Development of Pneumonia.—The almost universal practice of compressing the lower lobe first has proven only partially successful in preventing the development of pneumonia in it. In Brunner's ninety-nine cases (many of them operated upon by Sauerbruch himself) fatal pneumonia occurred five times in the lower lobe of the operated side, and in Stöcklin's ninety-six cases, twice (lobe not specified). But a much more frequent and serious complication that follows operation upon the lower ribs is pneumonia in the lung of the opposite side. This happened and was fatal seven times in Brunner's ninety-nine cases and four times in Stöcklin's ninety-six cases, and frequently this same complication has been reported by other surgeons.

Undoubtedly pneumonia does occur after thoracoplasty and extrapleural pneumolysis operations that are confined entirely to the upper lung. Twelve years ago Sauerbruch [14] reported the case histories of his first forty-three thoracoplasties for pulmonary tuberculosis. Among them are five operations (on four patients) in which portions of from three to six ribs were resected but in which no rib lower than the seventh was removed. Two of the four patients developed aspiration pneumonia, one dying in three months, the other in eight months; in one case the pneumonia was in the lower lobe of the operated side, in the other case in both lower lobes. Because of this experience Sauerbruch became an ardent advocate of primary resection of the lower ribs. In an extensive survey of the world's literature, which includes reports of a number of small series of thoracoplasties confined to the upper ribs and many cases of primary upper lobe extrapleural pneumolysis with "filling," I have not found evidence that supports Sauerbruch's fear of primary upper lung compression as the cause of post-operative pneumonia. Relatively few cases of pneumonia have been reported, whereas reports of pneumonia following primary resections of the lower ribs are relatively frequent.

Explanation of this is not to be found in the fact that those patients who undergo the two-stage Sauerbruch thoracoplasty are sicker than those who have only partial operations; in six of the ten Sauerbruch-Brunner pneumonia cases the daily sputum amount was thirty cubic centimetres or less. The anæsthetic cannot be blamed, as eight of the ten operations were performed entirely under local anæsthesia. Nor can it be said that the operative shock following the thoracoplasties that result in pneumonia is greater than after those operations that are confined to the upper ribs; in eight of the ten Sauerbruch-Brunner cases pneumonia developed after resections of as few (of the lower) ribs as are removed by those surgeons who operate upon only the upper ribs.

The slightly increased respiratory activity that is imposed upon the unoperated lung after thoracoplastic relaxation of a part of the opposite lung, or even of the whole of it, cannot be held accountable for the development of pneumonia for the reason that pneumonia is extremely rare after total compression of one lung by artificial pneumothorax. Finally, over-autotuberculinization cannot be held accountable for the reason that thoracoplastic relaxation or compression of only the lower lobe, in which the tuberculous lesions are usually relatively scarce, does not squeeze a large amount of tuberculous toxins into the general circulation.

Impairment of the Function of Expectoration Is Chiefly Responsible for the Development of Pneumonia.—From the evidence that has been presented here the conclusion is unavoidable that the high incidence of pneumonia following resection of the lower ribs is due to stasis of secretions that results from operative crippling of the function of expectoration.

It is known that the lower chest and abdomen play by far the most important part in the act of coughing and expectorating. After an inspiration the chest muscles that control expiration, and particularly the powerful muscles of the abdominal wall, unite in a violent contraction that forces the diaphragm and chest wall against the lung. When the glottis is opened the air and bronchial secretions are propelled toward the mouth. After thoracoplasty upon the lower ribs this function is greatly interfered with. Post-operative pain in itself prevents normal coughing for many days or weeks. In addition, the ribs are sectioned and prevented from moving properly and part of the force of the cough is dissipated in bulging the "de-ribbed" chest wall; many of the thoracic muscles of expiration are incised and crippled; the lower intercostal nerves, which supply all the important muscles of the abdominal wall, are traumatized by the operation.

As man is unable to control his abdominal muscles so as to restrict coughing to one side, it is obvious that the pain and crippling occasioned by operation upon the lower chest of one side prevents, to a large extent, proper coughing upon both sides. This, together with the fact that the breathing lung of the unoperated side is more liable than the compressed lung to aspirate infected secretions, accounts for the higher incidence of pneumonia in the uncollapsed lung; in Brunner's series pneumonia occurred in the uncollapsed

lung five times, in the collapsed lung three times and in both lungs twice; in Stöcklin's series: in the uncollapsed lung four times, in the collapsed lung twice.

The most important piece of evidence in support of the conclusion that pneumonia following thoracoplasty is due to crippling of the function of expectoration is the fact that it occurs far more frequently after that stage of the operation that resects the lower ribs than after that which resects the upper ones. Among the sixteen cases of post-operative pneumonia reported by Brunner and Stöcklin, twelve occurred after resections that were confined to the lower chest where the tuberculous lesions were usually absent or few in number. In three additional cases the lower and upper ribs were resected at the same operation; these cases suffered not only the disadvantages of a primary lower lobe thoracoplasty, but also the additional pain that came from the resection of the upper ribs. Therefore, fifteen of the sixteen cases of pneumonia occurred after operations that included the lower ribs. Only one case followed thoracoplasty which was performed upon the upper ribs several weeks after the lower ribs were resected without complication. The logical explanation of the fact that few cases of pneumonia occur under these conditions is that the ability to use the lower chest for purposes of expectoration returns in some measure during the several weeks that elapse between the two stages of the divided operation.

Additional clinical evidence that shows the important relationship between the occurrence of pneumonia and the impairment of the expectorating function is furnished by the relative frequency with which pneumonia appears after operations upon the upper abdomen, or after a deep general narcosis which abolishes the cough reflex for a considerable time. Furthermore, it is well known how often pneumonia follows tuberculous hæmoptysis when infected blood finds its way into uninfected portions of the lungs and clots there while the patient's cough reflex is subdued by opiates.

It is clear from what has been said that the danger of pneumonia is less from aspiration of secretions than from failure to expectorate what small amounts of infected material may already be present in the lungs, or, which may find its way to uninfected lobes by the processes of aspiration, trickling or mere extension. But whatever the manner by which infection reaches the lower lobes of either the operated or unoperated sides, it is a fact that pneumonia frequently develops in spite of Sauerbruch's primary resection of the lower ribs. In my opinion it develops chiefly because of the lower rib resections. Émile Sergent [17] and Ameuille [3] have demonstrated how easily bronchial emboli that are aspirated to the base of the lung are usually expelled by coughing and that, therefore, the development of pulmonary infection does not depend so much upon the mere contact of infectious material with the lung as upon the duration of that contact. The deep inspiration taken by tuberculous persons immediately before a cough furnishes the most favorable possible condition for the aspiration of infected bronchial secretions, and, yet, gross aspiration pneumonia develops relatively infrequently.

Prevention of Pneumonia.—Full mention has been made of Sauerbruch's insistence upon compressing the lower lung first to prevent aspiration of infected secretions that will be pressed out of the much diseased upper lung when it is compressed later. Fully realizing the high incidence of pneumonia after complete thoracoplasty, Sauerbruch [15] makes every effort to maintain expectoration and prevent stasis pneumonia. He gives morphin to reduce the pain so that the patient will be willing to cough. He has a specially trained nurse in constant attendance for several days and nights, and whenever the patient expects to cough, she places her hand firmly against the weakened chest wall in order to support it. In an attempt to prevent stasis pneumonia, Jaeger [11] sees to it that his patients expectorate every half hour, day and night.

Several years ago Sauerbruch [15] considered the combination of an artificial pneumothorax over the lower lung, followed by a thoracoplasty limited to the adherent upper lung, an ideal procedure because the pneumothorax gives an excellent compression of the lower lung, thereby preventing aspiration, and because when the pneumothorax is eventually released he hoped that the undiseased lower lung would resume function. This procedure had the additional advantage of sparing the lower ribs to carry on expectoration. In only one of the fourteen cases reported by Brunner [7] did pneumonia develop after this operation; in that case it had no direct connection with the operation as it did not commence until after a severe angina and metastatic wound infection, which occurred one month after operation. For reasons that are not pertinent here, Sauerbruch and most other surgeons have abandoned the combination of partial artificial pneumothorax with partial thoracoplasty.

Earlier in this article it was demonstrated that as far as the prevention of post-operative pneumonia is concerned, resection of only the upper ribs is far preferable to primary resection of the lower ribs and secondary resection of the upper ones. But extensive experience has shown that compression of only a part of one lung, even though it contains most of the clinically evident tuberculous lesions, is not sufficient to control the disease. Frequently latent lesions that are present in the lower lobe become active and progress, if that lobe is not also relaxed and rested.

An ideal operation would be one which would keep the lower lobe from aspirating infected secretions at the time the upper lobe lesions were emptied of their infectious contents, and yet would not impair the function of expectoration, and, finally, which would rest and relax the entire lung sufficiently to heal the tuberculosis. The operation which I am advocating fulfills all of these conditions. I am not personally able at this time to test the method, but recommend it unreservedly to the profession for extensive trial. It consists in the minor operation of radical phrenicotomy, followed in several weeks by paravertebral thoracoplasty of the upper seven ribs (see illustration). Obviously this combination is less severe than the two major opera-

tions that comprise a two-stage thoracoplasty. The technic for radical phrenicotomy and for paravertebral thoracoplasty may be found in Brunner's [7] and Sauerbruch's [15] books and in a recent article by Alexander [1] in the American Journal of the Medical Sciences.

At the time of the thoracoplasty operation the upper seven intercostal nerves should be crushed. The resulting temporary sensory paralysis reduces post-operative pain, thereby making expectoration easier. The abdominal muscles, being innervated only by the lower intercostal nerves, are not paralyzed but are spared for coughing.

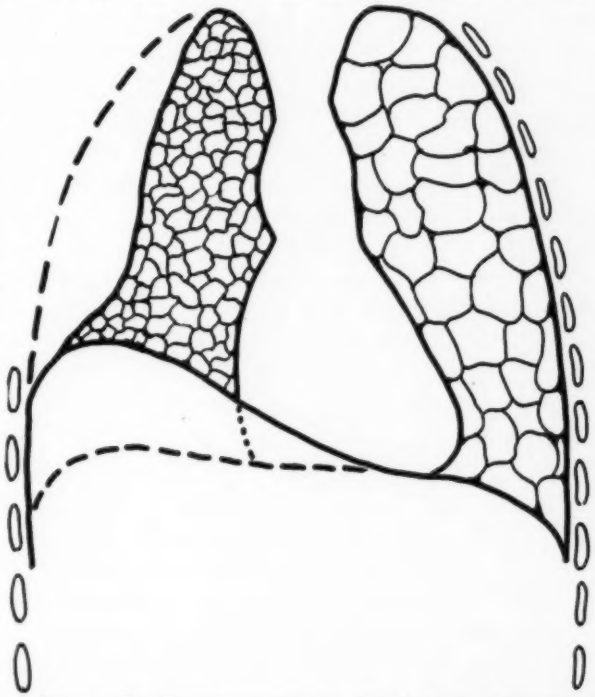

FIG. 1.—The diagram represents a frontal section through the posterior axillary lines. It illustrates the reduction in lung volume following total paralysis of half of the non-adherent diaphragm and paravertebral resection of the upper seven ribs. The pre-operative position of the diaphragm and chest wall is shown with interrupted lines.

Phrenicotomy paralyzes one-half of the diaphragm and causes it to rise and exclude the lower lobe from respiratory function almost to as great a degree as is done by the first stage of a two-stage thoracoplasty. Therefore, the danger of aspiration of infected secretions from the upper lobe is largely eliminated. In a few cases in which there was little or no disease in the lower lung and only a small amount of sputum from the upper lung, Sauerbruch [15] and Brunner [7] some years ago used phrenicotomy, instead of resection of the lower ribs, to prevent aspiration pneumonia, but they did not consider it sufficient for the purpose and so they insist upon primary lower thoracoplasty.

Contrary to expectation, cough and expectoration are easier after paralysis of the diaphragm than before, although the tidal air in the lung is less. This is explained on the ground that a relaxed atonic diaphragm allows the strong abdominal muscles, always much relied upon in the expiratory act of coughing, to act more quickly and completely in collapsing the lung. Lange [13] cites a case in which part of the anterior chest wall was resected for an intrathoracic cyst; phrenicotomy was performed. Later, when the observer's hand was put upon the breach in the chest wall while the patient coughed, his hand was pushed away with great force, demonstrating the power with which the abdominal muscles act upon the paralyzed diaphragm. In forty cases Lange [13] saw

no case of aspiration pneumonia, stasis pneumonia or isolated progression of the tuberculous disease in the lower lobe following phrenicotomy. Twenty-three of these patients declared that expectoration was easier after phrenicotomy than before; eight could detect no change, and not one complained of its being more difficult. Observations were recorded in twenty-four of Hauke's [10] patients; in ten the amount of sputum was increased for a time after operation (owing to the relaxation or compression of the diseased lung); in twelve expectoration was easier and in none was it more difficult. Felix [8] has made similar observations.

Following radical phrenicotomy the diaphragm rises into the chest and reduces the volume of a 2400 c.c. lung from 400 to 800 c.c., and in occasional instances nearly 1200 c.c. (Brunner [7]; Goetze [9]; Bérard [4]; Ziegler [20]). As a typical thoracoplasty of the upper eleven ribs reduces the lung volume only from 600 to 900 c.c. (experiments by Brunner [7]) it is apparent that a combination of phrenicotomy and thoracoplasty of seven ribs would reduce the volume of the entire lung at least as much as, if not considerably more than, a complete thoracoplasty. The effect of this amount of compression upon the tuberculous lung would be highly favorable. Brauer [6] finds that the clinical results of thoracoplasty vary with the degree of pulmonary compression.

If much tuberculous disease is present in the lower lung, it is wise to increase its compression and respiratory fixation by doing a paravertebral thoracoplasty upon the lower ribs from three to six weeks *after* the operation upon the upper ribs which, in turn, would have been performed several weeks after the original phrenicotomy. This should also be done if the diaphragm has failed to rise well into the chest because of being bound down by a thick diaphragmatic pleura and pleural adhesions. By operating in this order the first two operations will have "dried up" the lesions of the whole lung to a considerable degree. As a result the danger of stasis or aspiration pneumonia will be less than if the lower rib operation were done before either or both of the other two.

Sauerbruch [16] now performs a preliminary phrenicotomy in order to determine whether lesions in the opposite lung are sufficiently inactive to permit a subsequent thoracoplasty. It should be understood that phrenicotomy, followed by a complete thoracoplasty in which the lower ribs are resected first, is quite different in effect from phrenicotomy followed by thoracoplasty upon the upper ribs.

Primary operation upon the upper ribs, and secondary operation upon the lower ribs, as performed by Lambert and Miller,[12] does not possess all of the important advantages of the procedure which I advocate, although it seems undoubtedly to be a great improvement upon primary resection of the lower ribs. Of the advantages named in the following paragraph for phrenicotomy and upper rib thoracoplasty, the Lambert-Miller procedure possesses numbers 1 and 5, but not 2, 3, 4, 6 and 7.

Advantages of Primary Phrenicotomy and Secondary Thoracoplasty of

Upper Seven Ribs.—1. As the lower chest is not crippled, expectoration is maintained during the period when infectious secretions are present in the lungs. This period lasts until the pulmonary compression produced by the combined operation "dries up" the lesions.

2. As the inspiratory function of the lower lobe is greatly reduced by paralysis of the diaphragm, the danger of aspiration of secretions is diminished.

3. Paralysis of the diaphragm usually results in a surprising reduction in the amount of sputum and marked improvement in the general condition. This is a very great advantage as a preparation for the major operation upon the upper ribs. Improvement also takes place after the first stage of a two-stage Sauerbruch thoracoplasty, but the surgeon usually hesitates to wait more than three or four weeks for this improvement to continue, because it is important to perform the second stage of the operation before new ribs regenerate from the periosteum. After phrenicotomy it is permissible to wait as long as definite improvement continues.

4. Substitution of the minor operation of phrenicotomy for the major operation of lower rib thoracoplasty will lower the operative mortality of surgical lung compression for tuberculosis.

5. If the paralyzed diaphragm is not held down by adhesions, the combined operation reduces the lung volume at least as much as an eleven-rib thoracoplasty. If the upper lung contains a cavity, resections of the upper seven ribs should be of the Brauer [5] type. If the lower lung is much diseased a paravertebral thoracoplasty should be performed over it *after* completion of the phrenicotomy and upper rib operations.

6. There is less paradoxical respiration after phrenicotomy than after a lower rib thoracoplasty. This advantage, however, is not an important one as the amount of paradoxical movement of the "de-ribbed" chest wall after modern paravertebral thoracoplasty is not much more than that which takes place in a paralyzed diaphragm. Only in occasional cases it is dangerous after thoracoplasty; no harm has been reported from it following phrenicotomy.

7. There is less gross deformity after resection of only the upper ribs than when both upper and lower are resected. The scar that follows the incision for phrenicotomy is only six centimetres long, and lies in a natural crease of the skin of the posterior triangle of the neck.

Conclusion.—The high incidence of tuberculous pneumonia following resection of the lower ribs is due principally to impairment of the function of expectoration. Substitution of radical phrenicotomy for resection of the lower ribs, as the first operation to be performed, will probably lessen the danger of post-operative pneumonia as well as reduce the frequency with which fresh small tuberculous lesions develop in the unoperated lung.

In cases in which there is little or no clinical tuberculosis in the lower lung and in which the diaphragm rises well into the chest after phrenicotomy, resection of only the upper seven ribs has, in my opinion, important advantages over the one-stage or two-stage thoracoplasty of ribs XI to I, which is

now in general use. The combination of primary radical phrenicotomy and secondary resection of the upper seven ribs is worthy of extensive trial in such cases. When the lower lung contains more than a few tuberculous lesions, or when the diaphragm rises only a little into the chest after phrenicotomy, the lower ribs should be resected as the third stage of the operation.

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SUTURE OF STAB WOUND OF THE HEART*

TWO CASES WITH ONE RECOVERY

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To date 43 cases of heart suture with 24 recoveries for stab wounds have been reported by American surgeons, several of whom have had two or more cases. Foreign surgeons are credited with something over 200 cases. Approximately 50 cases of heart suture for injuries other than stab are on record.

Case I.—J. P., male, colored, aged sixteen years, was admitted to the emergency room of the University Hospital. (Case No. 25446) about 10 P.M., March 14, 1922, having been picked up in the street by a passing automobile and brought to the hospital. He was unconscious and no definite history was ever obtained. He had been present at a negro frolic where a fight occurred in which he participated and was seen to run from the house. How far he ran or what time elapsed before he was brought to the hospital, we could not ascertain definitely but approximately an hour and a half. He was seen at once by an interne who promptly called me. He had a small stab wound of the left chest through the fourth interspace about one inch from the sternum. He was in a state of shock, pulse very weak, rate about 170, heart sound muffled and indistinct, heart dulness markedly increased and there was evidence of fluid in the left chest. He was carried at once to the operating room which was rapidly "set up."

Operation was started under light ether anæsthesia at 10.45 P.M. and ended at 11.15 P.M. Incision was made in the fourth interspace, enlarging the stab wound. The knife blade had entered the fourth interspace, severed the fifth costal cartilage about one inch from the sternum and passed on through the pleura, pericardium, entirely through the right ventricle and through the posterior pericardium. The anterior wound of the ventricle was about one and one-half inches long, the posterior about three-quarters of an inch long. The pericardium was filled with blood and clot and the left pleural cavity almost filled. The apex of the heart was quickly delivered, the heart beating very rapidly in a "delirium cordis" and a steady stream of blood pouring out from each wound. Both were sutured with silk, five stitches in the anterior and three in the posterior wound thus controlling the hemorrhage but the heart ceased to beat because of excessive loss of blood. An effort was made to renew the heart's action by massage but without response. An injection of salt solution with adrenalin was given directly into the cavity of the left ventricle and this succeeded in restoring action for a few minutes but it gradually weakened, ceased and could not be revived.

Because of the loss of blood and resultant lack of volume, direct ventricular infusion appealed to us as the logical thing to do and with temporary success, but exsanguination was so nearly complete that it is doubtful if even a ventricular transfusion of blood could have brought him back. This, we thought of, but in such an emergency, of course, had no time to secure a donor or donors. An effort was also made to utilize some of his own blood obtained

* Read before the Southern Surgical Association, December 10, 1924.

from the pleural cavity, but it contained many clots, and before it could be filtered for reinjection life was extinct, upon looking up the literature subsequently, we found that Gutig had some years ago suggested the injection of salt solution into the cavity of the left ventricle, and it had been tried, "but without very encouraging results." We feel that the results were quite encouraging in the first case, a very definite response even after the heart had stopped. In the second, as will be shown below, there was a prompt response with the reëstablishment of normal rhythm and force, both of which were decidedly lacking prior to its use. Of course, this may have occurred after a period of time, but it was certainly gratifying to be assured of firm cardiac action before beginning closure of the wound.

CASE II.—C. J., male, colored, aged twenty-three years, laborer, was admitted to the emergency room of the University Hospital (No. 32209) 8.30 P.M. October 26, 1923, having been stabbed about fifteen minutes earlier in the left chest with the blade of an opened pair of scissors. He was brought in by the police patrol and but for their efficiency and promptness in getting him to the hospital, where he collapsed as he was being removed from the patrol, we should probably have had a less favorable report to make.

When admitted, he was semidelirious, bathed in a cold perspiration, restless and turning about upon the table, pulse very feeble and at times imperceptible. Blood-pressure was 90 systolic and 60 diastolic. The chest showed a small perforating wound one-half inch in length in the third left interspace just beside the sternum, which was not bleeding. There was a small skin puncture just in front of the left shoulder where the point of the other blade of the scissors struck. Cardiac dulness was increased to the right of the sternum about two inches and extended to about one inch outside the left nipple. Heart pulsation could barely be felt and the sounds were quite muffled and distant. These we felt indicated a puncture into one of the cavities of the heart with blood in the pericardium strangulating the heart, so-called Rose's "heart tamponade." There was also dulness in the left thorax posteriorly, indicating fluid in the pleural cavity. He was rushed to the operating room, which was "set up" in the shortest possible time. Ether anæsthesia was started at 9.15 P.M., approximately one hour from the time of injury.

Operation.—Semilunar incision along the left border of the sternum over the third, fourth and fifth ribs. Soft tissues and periosteum reflected and about two inches of the costo-chondral cartilages resected. Exposure of the fourth showed that the puncture was through its upper border. The left pleura and mesial border of the left lung were found to be punctured and clotted as well as fluid blood escaped from the chest. The lung collapsed with the opening of the pleura and thus controlled the bleeding from its injury such that it was not necessary to suture. The puncture into the pericardium was located behind the sternum and into the right auricle. An effort was made to catch the edges of the wound by placing a suture through the pericardium and into the auricle but the latter could not be grasped or caught with the needle. This effort was suggested by the experience in the former case, that as soon as the pericardium was opened and the clot evacuated the heart rate became so rapid as to interfere appreciably in the placing of the sutures. The pericardium was then opened by an incision parallel with the sternum and a large clot about the size of two fists evacuated. The force of the heart improved at once and the rate increased. The wound, one-half inch long, into the right auricle, upper border, came into view with the rotation of the heart during each systole (the stab had evidently occurred during systole) and would disappear during diastole. There was continuous bleeding from the wound. The edges were clamped with Allis' clamps to approximate same, the heart grasped with the hand, displaced backwards and to the left to

permit the placing of sutures, 00 chromic catgut. During this procedure the auricle was in marked fibrillation. After placing the first suture it was drawn taut, the opening plugged with the finger and the auricle permitted to recover from the fibrillation and reëstablish its rhythm. The suture was then tied. This method was carried out with each of the five sutures. In placing the fourth, the needle was impinged against the sternum and a very small tear made through which a little leakage occurred after it was tied, necessitating, therefore, a fifth suture to control bleeding absolutely. Several assistants had been trying to give salt solution intravenously but were unable to get into a vein in either arm or leg, even after exposure and isolation of a vein, because of their collapsed state. The heart's action was not reëstablishing itself as it should and unable to get fluid into a vein, a needle was plunged into the left ventricle and between 200 and 250 cubic centimetres of salt solution flowed in. The action promptly improved and when we were convinced of same, the ventricular infusion was discontinued. A slight tear was produced by the needle catching against the end of a rib during systole such that a little bleeding followed its withdrawal and necessitated a suture to control. The heart was watched for some time to be certain of its behavior and that there was no further bleeding. The pericardium was closed with a continuous suture of plain catgut, pleura, muscles and periosteum in layers with several interrupted sutures. Subcutaneous fat and skin closed with catgut, latter subcutaneously. Condition of patient at completion of the operation was good, pulse 105.

His temperature ranged about 102 degrees the first two days and gradually lowered to normal on the fifteenth day when he developed an acute tonsillitis with elevation again for four days when it again returned to normal during the rest of his stay in the hospital. There was never any evidence of infection, deep or superficial or of pericardial effusion. Dry pericardial rubs developed on the fourth day, gradually lessened and disappeared by the tenth day. With the reinflation of the lung, pleural rubs appeared on the sixth day, gradually lessened and disappeared altogether in a few days. He was dismissed November 22, 1923, the twenty-eighth day.

We feel that the prompt recovery, the absence of serious complications and the ultimate result were materially aided by the resection of the chest wall in that it tends, as emphasized by Zeidler, to prevent adhesions and the rigid wall from hampering the work of the heart, especially during the first few days, when it is quite irritable and striving so hard to recover from the insult.

He has worked as a day laborer this year and has had no handicap whatsoever. We have checked him over several times as well fluoroscoped his chest. The latter shows the heart to be normal in size and action with no evidence of pericardial adhesions. There are, however, some adhesions at the left pleural base, but apparently are not causing him any appreciable trouble.

In each of our cases the pericardium was distended with a large blood clot, "Rose's heart tamponade." Ventricular infusion offered us very satisfactory results, contrary to opinions quoted, and we would certainly commend it in any case where the heart response is not prompt after suture, whether due to heart shock or exsanguination. Since we had employed strict operative technic, we felt there was no indication for drainage either of pericardium or of pleura. In another case, however, we would empty the pleural cavity as nearly as possible by aspiration, possibly even wash it out. This, it seems to us, would offer a very satisfactory substitute for drainage with none of

its annoyances, and by removing at least the excess of blood prevent the formation of adhesions. If this were done at the beginning of the operation, or even while the patient was being prepared and anæsthetized, the blood collected in a vessel containing sodium citrate to prevent further clotting, it would offer the possibility of reuse, either injected into a vein or directly into the cavity of the left ventricle and might therefore be a means of saving a few additional lives.

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CHOLECYSTECTOMY; EXTERNAL AND INTERNAL CHOLECYSTOSTOMY *

By John B. Deaver, M.D.
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Cholecystectomy I believe is the indicated operation in most of the diseases of the gall-bladder, in early disease of the peri-pancreatic lymph-glands, in early disease of the pancreas, and in early biliary cirrhosis. In advanced disease of the peri-pancreatic lymph-glands, in advanced disease of the pancreas, and in advanced biliary cirrhosis, cholecystectomy alone will not suffice, but must be combined with drainage of the common duct, if the condition of the gall-bladder precludes the making of an internal drainage.

Cholecystectomy likewise is indicated in uncomplicated, advanced chronic disease of the gall-bladder as well as in carcinoma, hour-glass deformity, in ultra-acute conditions, as ulcerating, gangrenous, phlegmonous and membranous cholecystitis, pathologic fistulæ between the gall-bladder and a hollow viscus, obstruction of the cystic duct and injuries of the gall-bladder, and occasionally in ruptured gall-bladder. In certain ultra-acute cases where the patient is very ill and at the same time obese, a preliminary cholecystostomy and secondary cholecystectomy is safer. In these urgent cases where opportunity offers, the question of hepatic function must be seriously considered, especially in the patient with jaundice. I am indebted to the Chief of the Pathological Laboratory of the Lankenau Hospital, Doctor Reimann, for the following brief explanation of hepatic function.

An accurate estimation of hepatic function is of equal, and as we have come to believe, of greater importance than an estimation of kidney function. The tests which have been devised for determining the functional ability of the kidney are eminently satisfactory from the practical point of view, but unfortunately those which have been devised for the same purpose concerning the liver have not given the results which are necessary for an accurate decision. There are probably a number of reasons for this. The chief function of the kidneys, as far as we know, is excretion, and the product of excretion can be accurately collected and analyzed; furthermore, the kidney deals chiefly with end-products, and our knowledge of the metabolism of end-products is far more complete than our knowledge of the intermediate products of metabolism with which the liver has a good deal to do. There is no one who will deny that the function of the kidney is complicated; the function of the liver is much more so, because it is concerned not only in excretion, but also in secretion. Substances are sent by the liver in two directions, bile toward the intestine, and sugar, urea, etc., toward the blood.

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The liver is greatly concerned in carbohydrate metabolism, but it also has to do with the metabolism of proteins and fats. In order, therefore, to make an appraisal of the functions of the liver, we must necessarily examine its ability with regard to all of these factors. We need hardly call attention to the difficulties in collecting all the bile, and if all is not collected over a given test period, the results of course are necessarily inadequate. There is a probability that if one function is diminished, others are apt also to be affected, but we have no proof of it any more than we have proof of the relative suppression of function of one to the other; furthermore, there is always the possibility that one function may be impaired and the others scarcely interfered with. In brief, the quantitative relations are entirely unknown, and in addition, the relative importance, to the organization as a whole, of the individual functions is also unknown to any mathematical degree. Furthermore, the liver has a very large margin of safety, as large as, if not larger, than most other organs of the body. This means that for any test to be of value, the results must indicate wide differences. From these considerations it is clear therefore that examination with one substance or another, as, for example, phenoltetrachlorphthalein, can give results which are short of the theoretical and also practical desirability. We feel that allowing the patient to remain in bed for a few days while careful examinations are made of those constituents of the blood which are ordinarily examined under several different circumstances, diet, water-intake, etc., together with functional tests of the urine, are more valuable than one single test applied directly to the liver. In our hands phenoltetrachlorphthalein, if relied upon with nothing else, is liable to prove disappointing, but if used in conjunction with the other data, it has a definite auxiliary use.

The anæsthesia, etc., is also important. While formerly I practically always used ether, I now rarely do. Most of these operations (except in the occasional very fat and nervous patients) are done under nitrous oxide and oxygen, occasionally supplemented by apothesine intraspinally.

Cholecystostomy may be either external, as when drainage of bile is carried to the outside; or internal through a cholecysto-duodenostomy, cholecysto-gastrostomy, or cholecysto-enterostomy. The essentials of any of the internal cholecystostomies are a patulous cystic duct and a comparatively normal gall-bladder, or at least one that will function; also a cystic duct which does not enter the common duct at the ampulla, as was seen in a recent case that came to autopsy. External cholecystostomy may suffice in cases of catarrhal cholecystitis where the gall-bladder is not markedly diseased (grossly), if this can be told; in cases of mild chronic infections of the liver and biliary passages, in subacute or mildly acute cases of pancreatitis, and finally in a first-stage operation in some cases of obstructive disease of the common duct. It is a question whether the operation should not be confined to the latter condition.

The debate of cholecystostomy versus cholecystectomy continues, but as far as I can learn surgeons of large experience with disease of the biliary

passages are practically of one mind about cholecystectomy being the better operative procedure in most cases when the question between external drainage and removal is considered. Those of us who have the advantage of a systematic Follow-up Service have the evidence of the soundness of the surgeon's position in favor of removal as against drainage.

In non-calculous cholecystitis, before removing the gall-bladder one must be sure of the absence of indications for draining the biliary passages, and furthermore that a diseased appendix in a high position is not the cause of the trouble.

My reason for making this communication before the Academy is to consider with you the advisability of retaining the gall-bladder in a certain number of cases, such as: Calculus cholecystitis, where the cystic duct is patulous and the walls of the gall-bladder have not lost their normal elasticity; where the gall-bladder is not opaque and not covered by a layer of subserous fat; where the peri-pancreatic lymph-glands are enlarged or where there is more or less marked hardening of the head or the body of the pancreas, and in early chronic hepatitis and chronic cholangitis.

The first problem in the discussion is the function of the gall-bladder. Has the gall-bladder a duty to perform and is this duty of enough significance for the surgeon to recognize and respect and direct his operation accordingly?

The gall-bladder is supposed to act as a reservoir for storing bile and its removal is usually followed by dilatation of the common duct. As far as we can judge clinically and from the standpoint of general metabolism, it matters little whether or not the gall-bladder is present, although it has not been proven that the gall-bladder is entirely useless. This of course, is not enough reason for removing it. It has been claimed that what goes into the gall-bladder never passes out, but convenient as this theory might be, it is not borne out by our studies on the living subject. Rous and McMaster have shown experimentally that under normal conditions there is a great and rapid concentration of bile in the normal gall-bladder, and that in a period of twenty-two and a half hours the bulk of the bile which passes into the gall-bladder may be reduced eleven times. They believe that if the gall-bladder is present in obstruction of the common duct, the bile will be dark and tarry, owing to its concentration in the gall-bladder. On the other hand, if the cystic duct is obstructed or the gall-bladder is diseased, no such concentration takes place and the common duct will contain colorless, so-called white bile, even if the patient is jaundiced. To offset the latter statement we know colorless (white) bile is found in man in cases of obstruction of the common duct in the presence of a normal cystic duct and a normal gall-bladder.

One of the arguments that has been advanced in favor of leaving the gall-bladder in, is that the presence of its mucous excretion has a definite beneficial effect upon the bile, reducing its toxicity if it passes into the pancreatic duct. This theory, however, has been exploded both by experimental and practical work.

Other reasons given by the advocates of cholecystostomy are that the

operation is less dangerous than cholecystectomy; it fulfills more indications, and it conserves the gall-bladder which may have to be used at some subsequent time in the life of the patient. These are valid enough reasons, but as I view it cholecystectomy accomplishes more than cholecystostomy. That cholecystostomy in the hands of the surgeon not working daily in the upper abdomen, is a simpler as well as a safer procedure than cholecystectomy, I admit. This applies particularly to the acute cases affecting stout and nervous patients who usually take the anæsthetic badly, or when the patient is seriously ill and his natural resistance reduced. In the hands of the more experienced surgeon there is no great difference in the mortality of the two operations. In the hands of the less experienced the mortality of cholecystectomy will be larger than cholecystostomy under the same conditions. In addition to the increased mortality of cholecystectomy in the latter hands there will also probably be more injuries of the common and hepatic duct.

Then there is the question of end-results: Do more cholecystectomized cases remain perfectly free from the former symptoms than cholecystostomized? I believe the experience of the majority of surgeons is that more of the drainage cases (external cholecystostomies) suffer recurrences, than of the ectomized cases. A point made in favor of cholecystectomy as against external cholecystostomy in marked calculous cholecystitis, is that after the gall-bladder is removed the common duct can be more easily explored by the introduction of forceps or a probe carried through the mouth of the cystic duct than it can be by palpation alone with the gall-bladder *in situ*. The well-known reason for this statement is that in a very small percentage of gall-stone operations a stone in the common duct may be overlooked. Personally I do not consider this a strong argument. In my experience exploration of the common duct by passing a probe through the mouth of the divided cystic duct is not so satisfactory as splitting the duct and carrying the incision into the common duct, because in this way a larger probe can be passed and one can be much surer of the patency of the common duct and of the papilla of Vater. Furthermore, if necessary, this allows the gall-stone scoop to be passed, which cannot be done through the mouth of the divided cystic duct.

The chief advantage of internal drainage in gall-stone disease is primarily that it is supposed to be more permanent than external drainage; it shortens the convalescence, and is not so uncomfortable as external drainage. The conditions in which I most often make use of internal drainage are, in calculous cholecystitis occurring past middle life, complicated by chronic pancreatic lymphangitis, chronic pancreatitis and early biliary cirrhosis, and in irremovable obstruction of the lower end of the common duct, most commonly due to carcinoma of the head of the pancreas. Where the neoplasm affects the head of the pancreas it will not always be possible to make a cholecysto-duodenostomy, and in such instances a cholecysto-gastrostomy or cholecysto-enterostomy would be indicated. It goes without saying that in order to secure lasting permanency of the cholecysto-duodenostomy opening, the common duct must be occluded.

The third point for consideration is, will a gall-bladder once inflamed, which means infected, ever entirely recover? I am responsible for the statement that a gall-bladder which has once become infected never gets quite well. I am still of this opinion. Not entirely recovering means of course if these gall-bladders were examined pathologically and bacteriologically there would be evidence of morbid changes. In not all cases of so-called recovery following an inflammation is the gall-bladder left functionless, that is the color is only slightly if at all changed, its elasticity is not materially impaired, the cystic duct is not obstructed, therefore the organ is capable of receiving the same amount of bile it did before it was inflamed. It is this type of gall-bladder, other things being equal, that allows of an internal drainage being made, and for this, if for no other reason, in the event of future inflammation occurring in a gall-bladder that has been drained into the duodenum, the organ is better able to take care of itself. We must, however, admit that a gall-bladder once inflamed is more vulnerable than before it was the subject of the attack. There should be less chance of reformation of stones in the gall-bladder that is constantly draining since there is less chance for retention.

Internal drainage is not permissible where there is any question about the degree to which the gall-bladder has been affected. For one of the requirments in the selection of the gall-bladder where internal drainage is to be instituted is careful digital and electric light examination of the interior in order to be as reasonably sure as one can be that it is safe to leave the gall-bladder in, and also to rule out the possibility of very small stones being imbedded in or adherent to the mucosa; if such are found and cannot be dislodged cholecystectomy should be done. If it is found best to take out the gall-bladder and at the same time drainage is indicated, the latter should be carried out by introducing a T-tube into the common duct, except in the very rare instances where the common duct is so large that an anastomosis with the duodenum can be made.

The arguments that may be offered against internal drainage are that a gall-bladder once infected is always infected; to leave a gall-bladder that has been infected favors a recurrence of infection as well as the development of carcinoma; a gall-bladder that has been the seat of stones favors future stone formation.

These probabilities, however, are much more likely to occur where external drainage is practiced than with internal drainage, assuming that the new outlet, made as large as the gall-bladder will permit, remains open for a considerable length of time, and that great care has been taken in the selection of the gall-bladder to be drained. In the gall-bladder where the fundus does not project beyond the edge of the liver, unless exceptionally large so as to allow of lateral anastomosis, this operation is out of the question. Other less common conditions in which internal drainage is used are, large diverticulum of the common duct, irremovable carcinoma of the common duct distal to the junction of the cystic with the common hepatic duct, and in irreparable injuries of the common duct, distal to the cystic duct.

Most of the patients in whom I have established internal drainage for inflammatory conditions have made speedy and uninterrupted recoveries, and up to the present have not complained of recurrent symptoms such as occur after a small percentage of the cholecystectomies done during the same interval. I admit that the length of time since some of these operations have been made has not been long enough to permit a final judgment.

In some cases of external cholecystostomy where the patients are much jaundiced and in a dehydrated condition which cannot be overcome by continuous proctoclysis of normal salt and glucose solution, it is the practice of some surgeons to feed the patient with his own bile. It is believed that maintenance of the normal bile salt content is essential, and it has been shown that the salts in the bile gradually diminish with external drainage to about one-tenth of normal quantity. If this is true, then internal drainage when feasible, is a better procedure than external drainage.

SYPHILIS OF THE STOMACH *

A CRITICAL REVIEW OF REPORTED CASES FROM THE PATHOLOGICAL AND CLINICAL VIEWPOINTS

By John A. Hartwell, M.D.
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Andral [1] reported two cases of supposed syphilitic disease of the stomach in 1834, and from that date to the present time, there has existed a controversy over many aspects of this condition. Andral based the diagnosis upon the existence of severe gastric symptoms in two patients known to be suffering from syphilis, who were greatly benefited or cured by the administration of mercury and iodide. Following his report, many other cases of a similar nature were published, but so far as we can find, no serious study from the pathological viewpoint was undertaken until 1891. Chiari [2] in that year published a comprehensive paper with a review of the literature, in which he emphasizes the rarity of syphilis of the stomach as demonstrated by histological evidence. He could find only seven reported cases that he was willing to accept as beyond question. To these seven cases he added two others which had come under his personal observation in the autopsy room. He definitely formulated the necessity of basing a diagnosis of syphilis of the stomach on histological evidence only. His analysis of all the previously reported cases in which the diagnosis rested on any other foundation, resulted in his rejection of such cases as unproved. This conclusion was reached by a study of 243 autopsy examinations of persons dying from syphilis, the disease being congenital in 145 cases, and acquired in 98 cases.

The influence of his work was very great, and his teaching was practically accepted by all writers until the introduction of the Wassermann reaction and of röntgenology as aids to our clinical study. Prior to this time a few isolated reports appeared, but the authors were very careful to question their own diagnosis because of the lack of histological evidence. Since this time the teaching of Chiari and those immediately following him, has been to a considerable extent lost sight of, and to-day in increasing numbers case reports are being published in which the diagnosis lacks not only histological evidence, but in an astonishingly large number, even sound clinical evidence (Fig. 12). A note of warning against this tendency has been sounded repeatedly, but apparently without producing the desired result. For this reason a critical review of the situation as it now presents itself may not be without value. Perhaps the most convincing form that such a review can take will be found in a detailed study of the comparatively few cases in which the diagnosis rests upon sound histological evidence, followed by an attempt to make those reported cases which rest upon other evidence conform to the former group, and failing this, to exclude them as examples

* Read before the New York Surgical Society, January 14, 1925.

of syphilis of the stomach. Unfortunately the number of reported cases in which histological evidence is lacking has increased so rapidly, and has now reached such a large total, that it would be an impossible undertaking to present their merits or demerits in detail. For this reason only those cases will be discussed which present substantial grounds for maintaining the diagnosis of syphilis of the stomach.

Chiari found but one case of the disease in the 145 congenital syphilitics on whom he performed an autopsy, and one case among the 98 subjects dying of acquired syphilis. In the former group 40 cases died soon after birth, and in one of these there was found a diffuse infiltration of the mucosa and submucosa of the stomach, which Chiari believed to be syphilis, but was unwilling to positively so class it. In 75 of this group living to later childhood, 27 showed marked circulatory changes in the stomach, such as hemorrhagic erosions, punctate hemorrhages, hyperæmia, and also œdema of the sub-mucosa. These he assigned as secondary to the syphilitic changes in the liver, but excluded them as actual syphilitic lesions of the stomach. In the acquired cases there were 37 that showed changes similar to those found in the older children, and in one case there was a true peptic ulcer, and in one the scar of a healed ulcer. The author was unwilling to accept any of these conditions as being the direct result of syphilis. Thirty-six of these cases occurred in patients who had died with the lesions of far-advanced syphilis. These observations are of the utmost importance, but have been lost sight of by many recent writers who have depended solely upon the

FIG. 1.—McNee's case from Quarterly Journal of Medicine, Oxford, 1921-22, vol. xv, pp. 215-226. A. Œsophagus. B. At pylorus. C. Similar to portion in which spirochætæ were found. D. Perforation.

therapeutic test in accepting the diagnosis of syphilis of the stomach. They demonstrate the presence of changes in the stomach, which are not actual luetic lesions, but which would beyond doubt be favorably influenced by the administration of anti-luetic agents.

Flexner,[3] in 1898, and Pappenheimer and Woodruff,[4] in 1906, each presented one additional case. They again reviewed the literature, and to Chiari's cases they were able to add five more, making a total of twelve cases. Pater,[5] in 1906, in a rather less critical review of the literature, adds seven cases which he accepts as histologically proved examples of gastric syphilis. The evidence is less convincing than in the cases accepted by the first-named

FIG. 2.—McNee's case from Quarterly Journal of Medicine, Oxford, 1921-22, vol. xv, pp. 215-226. Spirochætæ.

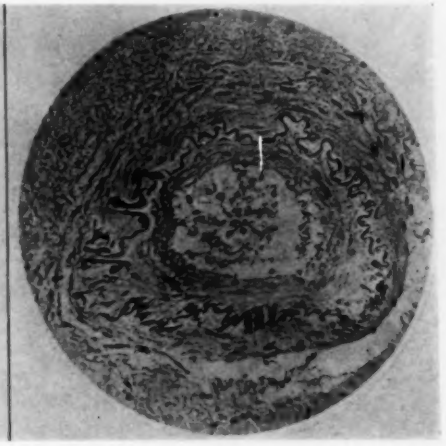

FIG. 3.—McNee's case from Quarterly Journal of Medicine, Oxford, 1921-22, vol. xv, pp. 215-226. Endarteritis obliterans.

writers, but one cannot find adequate ground for disregarding the diagnosis accepted by the reporters of Pater's cases.

In 1922, McNee[6] reported the only case in which the finding of the spirochæte proved beyond doubt the syphilitic nature of the lesion. Graham,[7] in the same year, adds one case in which the diagnosis rests on sound histological evidence. Brams and Meyer,[8] in 1923, report two more cases with acceptable histological findings. Our search to find additional cases has been unavailing.† The rarity of the disease where the diagnosis rests on histological proof is established by the fact that only these twenty-five cases are on record. Moreover, it is a fact of great importance that Chiari found his two cases in 243 autopsies on advanced syphilitics; that Pappenheimer's case was the only one in 4880 autopsies at Bellevue Hospital, of which number 316 (Symmers[9]) showed advanced syphilitic lesions; that Stolper found but one case in 86 autopsies on syphilitic subjects; that Turnbull[10] finds no case in nearly 13,000 autopsies and none in over 700 operative specimens

† Since going to press two additional cases have been found. Brams and Antoine[46] and Hemmeter and Stokes.[35] Some doubt that the latter is not tuberculosis may exist.

of stomach lesions coming to the Pathological Institute of the London Hospital. (v. i.) One is unable to explain away these figures in an endeavor to be credulous concerning the great number of reported cases resting on less secure ground than histological evidence. These twenty-five cases demonstrate beyond cavil that the spirochæte pallida does attack the stomach, that it sets up there lesions exactly similar to those found in other organs, and that the histological evidence of this is susceptible of proof.

Their small number, taken in conjunction with the enormous number from which they have been isolated, emphasizes that for some reason the spirochæte does not find a favorable soil for growth in the stomach. Some writers have been inclined to argue that since practically no organ in the body is immune to the ravages of syphilis, and since both the oral and the anal segments of the digestive tract are known to be attacked, the relative immunity of the stomach must be apparent and not real. The argument is unsound, and cannot be used to controvert undeniable facts. First, because the rectum is not as frequently the seat of syphilitic lesions as formerly taught, many of the supposed syphilitic strictures being secondary to gonorrhœal infections, and second, because the intestines also are comparatively rarely attacked. Symmers [9] in 316 syphilitics found no lesions in the small intestine, and only 5 in the colon. The immunity of the stomach may with our present knowledge be unexplained, but it cannot be denied.

It is unfortunate that few of the reported cases are complete in clinical data. For this reason our knowledge of the disease, based on proved cases, is very meagre, except in pathological detail, while the clinical conception has been evolved from material which includes many conditions very doubtfully syphilitic.

Chiari's [2] excellent study establishes the characteristics of the syphilitic lesion as found in his own cases and those previously reported. Later writers have amplified this somewhat but nothing essential has been added.

His conclusions are as follows:

1. Syphilis produces actual changes in the stomach.

2. They may be direct or indirect.

3. The first are gummatous or simply inflammatory infiltration.

4. Gumma may occur in both hereditary and acquired syphilis. The infiltration was seen only in the former.

5. The indirect results are due to syphilitic changes in other organs, for example the liver, or in producing the hemorrhagic diathesis, so-called hemorrhagic syphilis, and are relatively frequent.

6. Gumma always apparently first starts in the sub-mucosa and extends from there into the other coats.

7. Through the breaking down of the gumma, particularly because of the action of the gastric juice, ulcer, and ultimately scars may form; then only by the finding of other gummata or the remains of gummatous tissue can the syphilitic nature be established.

In Stolper's [11] case, and in Flexner's [3] more fully reported case, the ulcer was formed by necrosis due to obliteration of the blood-vessels. The latter's report is worthy of quotation.

The patient was a man, aged fifty-two, who in December, 1891, suffered from an acute attack of vomiting followed by fever. In August, 1892, a physical examination disclosed a much enlarged and tender spleen. Ascites developed and a tapping was done on April 20, 1893. He was tapped altogether sixty-five times in the next year, and a cirrhotic liver became palpable. He died in June, 1894. The autopsy showed a large hepatic gumma, a perforated syphilitic ulcer of the stomach and acute peritonitis. The spleen was adherent to the site of the ulcer but the perforation had taken place immediately adjoining this. In the fundus of the stomach 4 cm. from the cardia along the greater curvature was an ulcer 5 x 5 cm. in the centre of which was a perforation 15 x 3 mm. in size. Just above the perforation the tissues presented a greenish and necrotic appearance.

FIG. 4.—Graham's case from ANNALS OF SURGERY, 1922, vol. lxxvi, p. 449.

For the purpose of the microscopic study pieces of the ulcer from several different parts were subjected to examination. The principal microscopic characters are as follows: The pathological process is localized chiefly in the submucosa and exists in two distinct stages. The earlier stage is less frequently met with, and consists of a cellular infiltration of the submucosa, through which the tunic is rendered much thicker than normal. The cells belong, in general, to the type of granulation-tissue cells, many of which are large and epitheloid in appearance. They are interpolated between the old connective-tissue fibrils and collected into large, more independent foci. The infiltration extends from the submucosa into the muscular coat, and to a much less degree into the mucous layer. The muscularis mucosa is for the most part the limiting line above. Within the large cellular accumulations foci of necrosis occur. These are quite large and consist of centres of coagulation necrosis, in which much fragmentation of nuclei and emigrated polymorphonuclear leucocytes are prominent features. The form of necrosis is consistent either with tuberculosis or syphilis; in its acuteness it resembles that seen in the former disease. The necrotic foci extended freely into the muscle and not at all into the mucosa. The blood-vessels in this situation show a simple infiltration of the adventitial coat, except in the necrotic areas, where they are obliterated.

The later stage is more common, and is what is met with in all parts of the ulcer and the tissue forming its elevated boundaries. It consists of dense fibrous tissue, which again is developed chiefly in the submucosa, and then extends into the muscular tunic.

Scattered granulation-tissue cells are found among the developed fibrils. The blood-vessels are extensively diseased; endarteritis and endophlebitis obliterans, and hyaline thrombosis with organization are common. The serous coat, too, is thickened, and in some places about the adhesions greatly so.

The base of the ulcer is covered to some extent with mucous membrane, and only in its centre is it bare. The muscular coat is exposed in this part, and the more superficial fibres are quite necrotic. The elevated edges of the ulcer are clearly not the remains simply of the old mucosa and submucosa. This is proven by comparison with the surrounding intact mucosa, which is much less elevated. The microscopic examination shows the thickening to be due to a new development of dense fibrous tissue, such as was described in the later stages of the general pathological process.

There can, I think, be no doubt that the ulcer is of syphilitic origin; the character of the new tissue and the form of cell-death met with seem sufficient proof for this belief. But I think it much more improbable that it is due to the softening of a gumma. Indeed, I find very little evidence in support of such a view. On the other hand, the appearances described speak more for an indirect form of necrosis of the mucous membrane, brought about by the combined softening of submucous gummatous infiltration and the obstruction and obliteration of blood-vessels in the same situation. The mucous membrane thus deprived of its nutrition became necrotic, was removed, and the ulcer resulted. The submucosa suffered either directly through necrosis of the infiltrating cells, or, again, indirectly, owing to the vascular changes combined with the action of bacteria.

Pappenheimer's [4] case also is most instructive in that it gives undoubted evidence that when syphilis really attacks the stomach it produces lesions not to be mistaken for anything else. In general characteristics it follows closely the changes described by Chiari [2] and Flexner.[3]

Pater [5] adds to the gross lesions given by Chiari the condition of stenosis at the pylorus. In all these acquired cases there was to a greater or less extent the infiltrative process which Chiari reports as having been found only in hereditary syphilis.

McNee's [6] (Fig. 1) case being the only one in which the spirochæte has been demonstrated may be reported in detail. It also has an added significance in that at autopsy "aside from the stomach no other organ showed noteworthy pathological changes and nothing was found suggesting the presence of an antecedent syphilis." Syphilis had not been suspected and no Wassermann had been done. In all other cases studied at autopsy there were present syphilitic lesions in many parts of the body.

"On opening the stomach the first impression was that the condition was a gastric carcinoma of the scirrhous type. On closer observation, however, it was seen that the characters of the ulceration were peculiar. An examination of the lymphatic glands showed no evidence of cancerous invasion.

The lesser curvature of the stomach, from a point about one inch below the cardia to the pylorus, is completely ulcerated. The ulcer also extends over a large part of the greater curvature, and this portion has been cut in two in opening the stomach, so that part appears in the upper part of the opened-out specimen and part below. Two perforations are seen in the ulcer on the posterior wall of the stomach, fairly close together, while in two other adjacent spots penetration of the wall is almost complete. The chief characteristic of the ulcer is its irregular shape and greatly thickened borders. The floor is bare, but the margins are covered with shaggy shreds of necrotic tissue, mixed with shreds of tenacious mucus. Only about two-fifths of the stomach wall is free from ulceration.

The stomach wall is greatly thickened in most parts of the floor of the ulcer, except at the points where perforation has ensued. The thickness is fully half an inch in most places, while in relation to the raised margins it is fully three-quarters of an inch. In section the thickened wall has everywhere a dense pearly-white appearance, such as is often seen characteristically in scirrhous carcinoma of the organ. Particular attention may be drawn to one particular area of the lesion where the process appeared to be more acute and recent than elsewhere. A similar small area was originally present on the extreme upper border of the specimen, but was removed for histological examination. The results of the examination of this portion of the ulcer are dealt with later.

Sections from the central portion of the ulcer for microscopic study gave the following findings. The floor of the ulcer is composed of a thin layer of necrotic fibrous tissue,

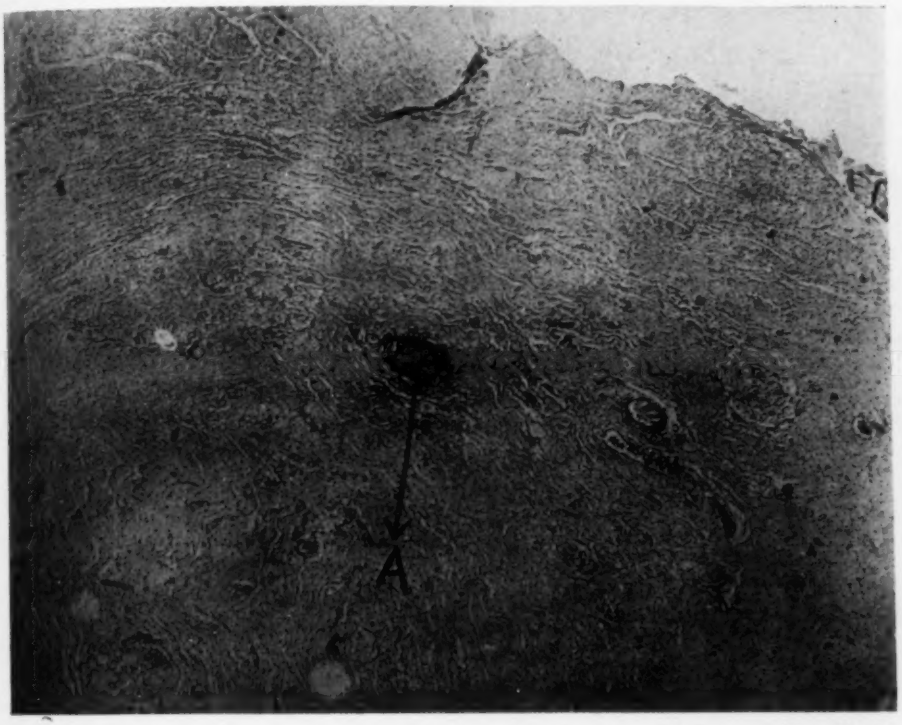

FIG. 5.—Graham's case from ANNALS OF SURGERY, 1922, vol. lxxvi, p. 449. Small gumma-like collection of round cells beneath the mucosa.

infiltrated with round cells. None of the mucosa or muscularis mucosa remains. Below this is a necrotic layer of dense adult scar tissue. In areas there is less adult connective tissue and numbers of small thin-walled capillaries; many surrounded with round cell infiltration. Arterial trunks are seen in the dense fibrous tissue, and their walls are thickened and show an advanced stage of endarteritis obliterans (Fig. 3), but no thrombosis. In sections from other parts of the ulcer, especially from the greatly thickened borders, the histological changes are of a much more active kind. The whole of the mucosa and submucosa is entirely replaced by an actively growing granulation tissue, which is necrotic and shaggy on its surface. There are abundant fibroblasts and thin-walled capillaries. The tissue is densely infiltrated with cells of lymphocytic type. The granulation tissue extends by branches along the larger blood-vessels into the muscular layers in some places, and in others the muscular coat is intact but round cell infiltration is seen around blood-vessels. The vessels in these parts are free from endarteritis. In a few places masses of granulation

tissue have necrosed and separated so as to expose even the deeper layers of the muscular coat. In this way perforation must have occurred, and since the blood-vessels have no endarteritis obliterans, the attacks of hæmatemesis are explained. No giant cells are seen. In sections from different parts it is possible to trace the pathogenesis from one stage to the other. Many sections were examined for the spirochætes stained by the Levaditi silver method. Eight blocks were so prepared, but in only one block were the spirochætes found (Fig. 2). So far as I have been able to follow the literature, this is the only positive case in which the spirochætes were demonstrated, though Wile [12] states that Warthin found them in a case operated upon at the University Hospital in Ann Arbor by Cabot, but he gives no details."

Graham's [7] accepted case is the first in which satisfactory histological evidence is found in a portion of the stomach removed at operation. There was a definite tumor about the size of a hickory nut along the greater curvature near the pylorus (Fig. 4). It was movable within the stomach and felt somewhat like an adenoma. A resection of the pylorus was done followed by a gastrojejunostomy by the Polya-Balfour method. Microscopical examination of the tumor showed numerous small gumma-like collections of round cells beneath the mucosa (Figs. 5 and 6).

Brams and Meyer [8] report two cases, also operative, which are so completely supported by histological evidence that the diagnosis is beyond question.

"The anatomical features of the resected specimens showed the characteristic changes which allowed the strongly presumptive diagnosis to be made at once. These were—the thickened submucosa, shallow, multiple and irregular ulcers, and the presence in Case II of visible miliary gummata. The entire pyloric portion of the stomach was thickened and infiltrated. Case I showed five irregular ulcers on the anterior and posterior wall (Fig. 7), while Case II had only three such ulcers on the posterior wall. The maximum diameters of the smallest ulcer were 15 x 5 mm. and 35 x 10 mm. in the largest. The average depth was 2 mm., and the comparatively smooth dark red base stood out in relief against the pale gray surrounding mucosa. The margins were somewhat raised and thickened, but there was no necrosis or caseation anywhere. Cut section showed the sub-mucosa to be thickened to about eight times its normal size in the region of the ulcers, and normal beyond them (Fig. 8).

"The chief feature seen on microscopical examination was perivascular infiltration which consisted chiefly of lymphocytes and a few plasma cells. There were many vessels involved in this manner, regardless of size, and both the veins and arteries were affected. Case II differed in that the vessels which showed changes in their walls were not so often seen to have this perivascular infiltrate. (Fig. 9.) Panarteritis and panphlebitis (Fig. 10), described by Fraenkel and considered by him to be solely characteristic of this condition when associated with such other conditions as the infiltrate, etc., were present. The process evidently began in the outer layers of the vessels, and then attacked the media and intima." * * * "Both specimens contained miliary gummata (Fig. 11), the number in Case II being greater than in Case I. These were located chiefly in the sub-mucosa, but some were present in the muscular layers as well." * * * "A few epithelioid cells were present near the periphery, and Case II showed one with giant cells of the Langhans type. The diffuse infiltrate consisted chiefly of lymphocytes with a few plasma cells and an occasional giant-cell. A careful search was made for spirochæte but none was found. There were a few long Gram-positive bacilli and Gram-positive cocci at the surface of the ulcer, but no tubercle bacilli were found."

At a meeting of the Royal Society of Medicine in London, where Monod [13] presented a paper on "Syphilis of the Stomach," and at which

McNee's specimens were presented, Turnbull [10] of the Pathological Institute of the London Hospital, discussed the subject from the pathological standpoint most instructively. He stated that histological diagnosis of syphilitic inflammation was even more difficult in the case of the stomach than in that of other organs. Infiltration with plasma cells, lymphocytes, and eosinophilic leucocytes are characteristic of most of the syphilitic lesions. Such an infiltration was found, however, in chronic pyogenic inflammation and was constant in chronic progressive peptic ulceration. Endophlebitis and endarteritis are characteristics of more intense syphilitic inflammatory reactions, but they might occur in chronic inflammations caused by any pyogenic organism. They were very common in chronic progressive peptic ulceration. Again, multinuclear giant-cells occurred in the intenser syphilitic inflammation, but similar giant-cells were present in many other conditions. A few giant-cells were frequently seen in the base of progressive peptic ulcers. In some cases their relation to crystals or to granules of pigment showed that they were "foreign-body giant-cells"; in other cases they were clearly epithelial in origin and were comparable to the epithelial giant-cells so conspicuous in certain chronic pyogenic inflammations of the breast and of the testicle; in other cases the cause and mode of their origin were not indicated. In order to ensure that his memory was not at fault, he had examined the slides from the twelve last specimens sent from the operating theatres last year. Infil-

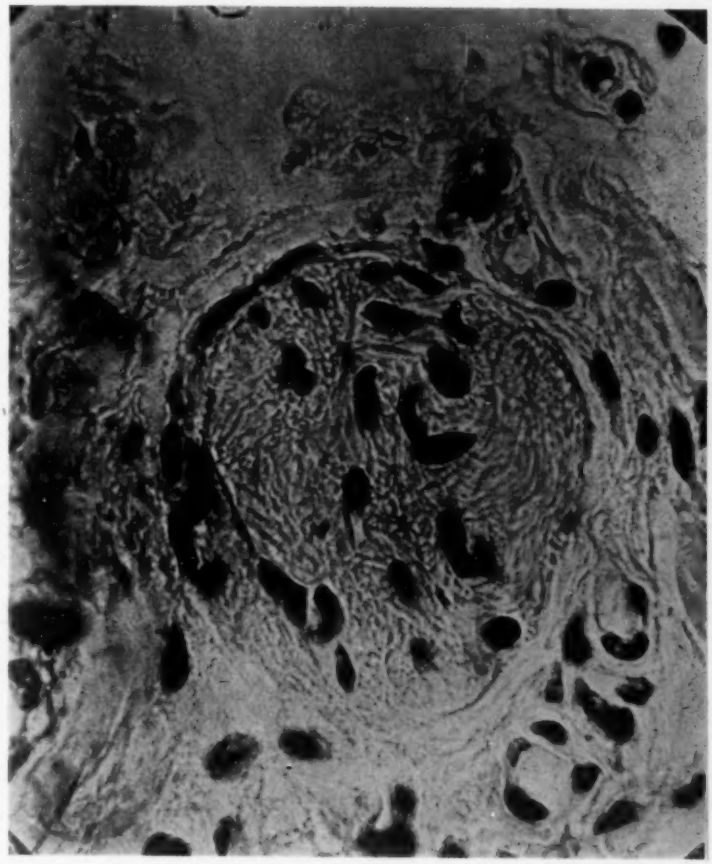

FIG. 6.—Graham's case from ANNALS OF SURGERY, 1922, vol. lxxvi, p. 449. Obliterating endarteritis.

tration of the above type was present in all; endarteritis was present in five; giant-cells were found in three. If the mere occurrence of the above histological phenomena were taken as evidence of syphilitic inflammation, then all, or almost all, progressive peptic ulcers must be accepted as syphilitic. But there was definite evidence against the majority of peptic ulcers being syphilitic. He then cited McNee's case, in which the spirochætes were demonstrated. Turnbull was glad to learn that in histology this specimen differed from ordinary progressive peptic ulcers. To the naked eye it was obviously no ordinary peptic ulcer. Had it resembled the usual chronic peptic ulcer then it would have shown that the recognition of syphilis must rest entirely upon the discovery of the spirochætes. Since 1909, Turnbull had examined operative specimens from 713 stomachs. In these there had been found no syphilitic lesion. The stomach had been examined at necropsy in nearly 13,000 subjects since he had come to the Institute in 1907. Any obscure abnormality had been removed for microscopic examination; further, his colleagues and himself had been specially eager to find syphilitic lesions. There was only one stomach in which a tentative diagnosis of syphilis might prove to be correct. Histologically the lesion in the stomach had the characters of an intense gummatous syphilitic inflammation. There was syphilis in other organs of the body. Turnbull was unwilling to exclude tuberculosis, but he believed the case was syphilis. No spirochæte had been found up to the time of the report, but the case was still under study.

An analysis of the twenty-five cases shows that the general characteristics as laid down by Chiari [2] are present in all of them, and that the obliteration of the blood-vessels, as emphasized by Flexner [3] and Pappenheimer,[4] is not infrequently the cause of the necrosis leading to ulceration. The distribution of the lesions in the stomach shows that all parts may be attacked, but that the posterior wall near the lesser curvature and toward the pyloric antrum is possibly a favorite site. Seven cases showed multiple lesions; either ulcers or gummata, or often both. A rather striking characteristic is the large size of the ulcer in many instances; Chiari's [2] covering the whole breadth of the posterior wall, McNee's extending along the lesser curvature from the cardia to the pylorus and involving three-fifths of the entire stomach, Flexner's [3] being 5 x 5 cm. in diameter, and Stolper's [11] extending from the cardia to the mid-gastric region along the posterior wall. An irregular serpiginous border is mentioned by Pappenheimer [4] and McNee [6] and several ulcers are reported as having greatly thickened borders with a hard smooth base. In many descriptions the expressions vary, but it is apparent that there was an unusual amount of thickening and rigidity of the stomach wall, often extending a considerable distance from the principle lesion. This thickening is always most marked in the sub-mucosa, but often extends into the other layers. In no case is there mentioned any perigastric infiltration except where perforation had taken place. This was present in Chiari's acquired case and in the cases of Flexner and McNee.

The destruction of the blood-vessels was evident in Flexner's,[3] Pappen-

heimer's,[4] and McNee's[6] cases, and gave definite explanation of the hemorrhage that has taken place in several of the cases.

Thus it is found that grossly syphilitic ulcer of the stomach differs in no distinctive way from simple gastric ulcer. Neither by its position, its size, or its outline can it be positively diagnosed with the naked eye. Suggestive factors are—its tendency to be large, its irregular serpiginous border, its firm smooth base and the presence of demonstrable thickening in the stomach wall at a considerable distance from the ulcer itself. Multiple ulcers are apparently more common than with the non-syphilitic ulcer. The finding of unbroken gummata as in Graham's,[7] Stolper's[11] and Weichselbaum's[14] cases, may greatly strengthen the suspicion of a syphilitic origin.

FIG. 7.—Brams and Meyer's case from Surgery, Gynecology and Obstetrics, Chicago, 1923, vol. xxxvii, pp. 127-133.

The clinical data given in connection with the proved cases is meagre except in Flexner's,[3] Stolper's,[11] McNee's,[6] Graham's[7] and Brams and Meyer's[8] cases. From these there can be drawn no facts on which a differential diagnosis from either carcinoma or simple peptic ulcer can be made.

Neither the pain, the vomiting, hæmatemesis, nor evidence of perforation was in any way characteristic. The duration of the symptoms did not vary from that seen in other conditions. The radiographs where reported did not give conclusive evidence of other than a serious gastric lesion. In fact, both Brams and Meyer's[8] cases were diagnosed from the X-ray films as carcinoma, and Graham's[7] report simply states "Lesion of pars pylorica—probably luetic. Small residue in stomach at end of twenty-four hours." It is worthy of emphasis that these patients all presented much more the general clinical picture of carcinoma of the stomach than of an ulcer. They were emaciated, their pain was severe, vomiting was marked and gave relief. Alkalies did not give relief, and in two of them the radiograph showed

conditions which were interpreted as carcinoma. In addition the HCl. content of the gastric juice was low or absent. On the other hand, many of the cases which have been diagnosed as syphilis of the stomach on the strength of a positive Wassermann and the radiograph, have proved to be carcinoma. (White,[25] Downes and LeWald.[20] Probably Hoover quoted by Pappenheimer.[4])

Since it has proved impossible to draw any accurate diagnostic picture from the histologically demonstrated cases, the attempt has been made to do so from those cases in whom the diagnosis rests on the positive

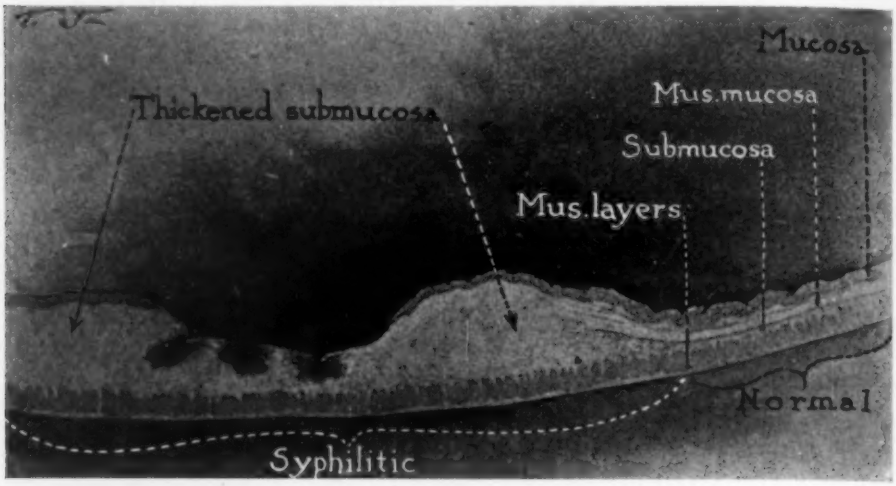

FIG. 8.—Brams and Meyer's case from Surgery, Gynecology and Obstetrics, Chicago, 1923, vol. xxxvii, pp. 127-133.

Wassermann reaction and a more or less satisfactory control of symptoms by anti-syphilitic treatment.

The earlier cases, reported largely by the French school, need not be considered because neither the Wassermann reaction, radiographic findings, nor chemical analysis is given in these reports. However, Hayem,[15] Fournier,[16] Fenwick,[17] Andral,[1] and Lancereaux,[18] with many others, have reported most striking cases over very considerable periods where the possibility of the condition being true syphilis of the stomach cannot be denied. There is nothing in the detail of these patients' histories which gives any basis for diagnosing the gastric lesion as syphilis, except that they were known to be suffering from that disease and accordingly the antisyphilitic treatment was undertaken.

In contrast to the rarity of syphilis of the stomach, as determined by positive histological evidence, its frequency as diagnosed without such evidence is very striking. This is in part due to the fact that the clinical reports are lacking in critical analysis. In part, however, it is due to the extreme difficulty of always proving by histological evidence the syphilitic nature of a lesion even when the material for examination is available. The statements by Turnbull,[19] already quoted, admirably explain these difficulties, and it

is accepted by all pathologists that many lesions may be syphilitic, even though the histology fails to reveal characteristic changes in the tissues. The fact that McNee [6] alone has been able to demonstrate the spirochæte in a syphilitic lesion, even where the microscopical evidence was convincing, shows that this final test of a positive diagnosis will be rarely found. It is noteworthy that McNee [6] found the spirochæte in only one portion of the lesion in his case, though a careful search was made for it in seven other areas. These difficulties have led the authors of reported cases to be less critical than they would be with other lesions, and it is a common occurrence in the literature to find accepted cases where the pathologist has only reported that the lesion is not malignant and has not the characteristics of a simple ulcer, or where he states that the lesion "may be syphilitic," or uses other expressions indicating uncertainty. Examples of this are found in Merril's [19] report, and in that of Downes,[20] LeWald,[21] LaFluer,[22] Eusterman,[23] Douglas [31] and others. Obviously it is unwise to exclude all such cases as being true cases of syphilis. On the other hand, it leads to a misconception unless one is most careful not to report cases as syphilis of the stomach where there is any lack of evidence from the clinical standpoint.

There are now recorded in the literature somewhat over 200 cases bearing the designation of syphilis of the stomach. A careful scrutiny of these shows that very many of them may be excluded without serious consideration. LaFleur [22] in 1903, Pater [5] in 1906, McNeil [24] in 1915, Downes and LeWald [20] in 1915, White [25] in 1917, have all reported cases which are worthy of serious consideration. On the other hand, reports of Tousey,[26] Weitzner,[27] 6 of Morgan's [28] cases, E. D. Holland,[29] many of LeWald's [21] cases, Kohn's [30] case, 2 of Graham's cases, Douglas' [31] case, Larimore's [32] 8 cases, and Merril's [19] 10 probable cases and 6 suggestive cases, do not seem sufficiently positive to enter into serious consideration. The cases of Niles,[33] J. Meyers,[34]‡ J. S. Myer,[35] and Morris,[36] as well as those of Fenwick [17] and Furno,[37] may be questioned. Eusterman reports forty cases as having come under his observation. It is impossible to draw sound conclusions as to the accuracy of the diagnosis in a majority of these. Operative material was obtained for microscopical study from ten. The reports are by no means convincing, and the microphotographs do not present the characteristic lesions demonstrated in the proved cases reported.

In view of the evidence given it is difficult to take seriously the statement by Castex and Mathis [39] that all cases of gastric ulcer are caused by syphilis, or the statement of Lang and Engel as quoted by Ewald [40] that 20 per cent. and 10 per cent. are so caused, or even the more moderate statement of Fenwick [17] that syphilis is the causative factor in 5 per cent. of gastric ulcer. Stokes and Brown [41] analyzed 200 syphilitic patients whose chief complaint was "stomach trouble." Twenty of these patients presented organic lesions of the stomach or duodenum; in only 8 did the

‡ The tabular analysis in the paper of Jerome Meyers is deserving of careful study.

authors think that true syphilis of the stomach was present, and they did not give sufficient data to determine the accuracy of their conclusion. White [28] found 44 patients with prominent stomach symptoms in a group of 600 cases of syphilis with strongly positive Wassermann reaction. In 35 of these 44 no definite lesion of the stomach was proved. In the remaining 9 there was a definite lesion, but two of these later came to autopsy and were proved to have cancer. White concluded that 5 suffered from ulcer of the stomach, but he was not willing to say that the ulcer was necessarily syphilitic. Two he believed to be suffering from true syphilis of the stomach, either induration or gumma. White makes this statement: "Since the free use of the

FIG. 9.—Brams and Meyer's case from Surgery, Gynecology and Obstetrics, Chicago, 1923, vol. xxxvii, pp. 127-133.

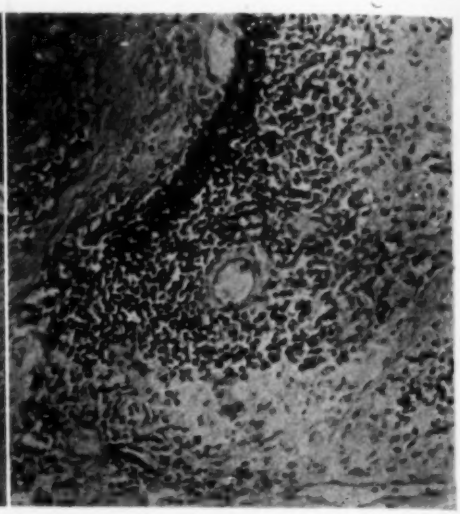

FIG. 10.—Brams and Meyer's case from Surgery, Gynecology and Obstetrics, Chicago, 1923, vol. xxxvii, pp. 127-133.

Wassermann test many cases with digestive symptoms and positive serum are classed as syphilis of the stomach, probably without reason. Even the relief of symptoms by treatment is not a sure guide in diagnosis, though if plaques, large indurated areas, hour-glass deformity, tumors easily demonstrated by X-ray or operation of a patient with positive Wassermann, have previously resisted treatment, and fade away under anti-syphilitic drugs, we have valuable evidence that the lesion was specific." This conservative statement made in 1917 has not received the attention that it deserves. Fowler [42] in 1921 presented a paper entitled "Benign Gastric Ulcer in a Syphilitic," in which he reported the case of a woman, aged twenty-six, who had a four-plus Wassermann, and at operation resection of the pylorus disclosed a simple ulcer. In this case neither a gastro-enterostomy or the administration of anti-luetics had been of benefit. Brams, in the discussion at the time the Brams and Meyer [8] case was presented, reported another case with four-plus Wassermann who had suffered from gastric symptoms for many months. At autopsy five days after admission, five superficial ulcers were found which proved not to be syphilitic. The one case which we present is added evidence

that the finding of a gastric ulcer in a patient suffering from syphilis or presenting a strongly positive Wassermann, is not of necessity a syphilitic ulcer. This has been recognized in the literature since the original report by Chiari,[2] and yet the tendency to disregard it is very strong in the writers of the present day. Our contribution to the subject has only a negative value, but this value is very great in that it demonstrates the need of extreme care in accepting the diagnosis of syphilis of the stomach.

The patient, a married woman thirty-nine years old, was admitted to Bellevue Hospital on October 10, 1924. She was married at the age of eighteen and never had been pregnant. Her menstrual history was normal until she was thirty-two, when for some reason not known, a double oöphorectomy was done. No history leading to a suspicion of syphilis could be obtained, and there were no relevant facts concerning previous illnesses.

In May, 1924, she first suffered from a gnawing pain in the epigastrium passing backward to the mid-lumbar region. This pain had persisted ever since and gradually vomiting became a constant symptom so that neither solids nor liquids could be retained. Alkalies gave no relief to the pain. There had been a steady loss of strength and weight, the latter amounting to forty pounds since the onset of the illness. Examination revealed an emaciated woman appearing chronically ill. Aside from the abdominal condition no abnormalities were found and there were no stigmata of syphilis either congenital or acquired. The abdominal wall is soft, relaxed and lacking in adipose tissue. No tumor is seen. Palpation in the epigastrium causes pain and an indefinite mass is palpable over the site of the stomach. A small discrete movable tumor is felt opposite the umbilicus on the left side. This was believed to be an enlarged mesenteric lymph-node. A gastric analysis from the fasting stomach returned 42 c.c. containing no free HCl, and a combined acidity of six. The blood on two separate examinations showed about 4,500,000 erythrocytes and 95 per cent. hæmoglobin, with 5100 white blood cells. The Wassermann reaction was four plus on October 22 and three plus on October 29.

The radiographic report was as follows: "Fluoroscopic examination shows an annular constriction of the pars media. Stomach is hyposthenic and deformed. There is a marked persistent irregularity of the lesser and greater curvature pars pylorica and media with decreased lumen. No gastric retention at end of six hours. *Diagnosis.*—New growth pars pylorica and media, scirrhus type." (Fig. 13.) This diagnosis was concurred in by the clinicians and accordingly an operation was done on November 7, 1924, with the following findings.

The stomach was moderately distended, not hypertrophied. It was quite mobile including the pylorus and first portion of the duodenum. In the lesser curvature of the pyloric antrum and extending into the pars media was a rather diffuse thickening involving an area of 2½ or 3 inches in diameter, the centre of which presented a palpable crater. On the serous surface there was evidence of some contraction and injection but no definite stippling. The pylorus seemed to be patent. There were several lymph-nodes about 1 mm. in diameter in gastrohepatic and gastrocolic omenta. Gall-bladder was small, of normal color and lay entirely outside the liver so that it practically had a mesentery of its own. Palpation of the pelvis revealed uterus present. Ovaries not found. In the small intestine exact location not determined but probably in lower jejunum was a mass about 2 cm. in diameter which seemed to infiltrate the wall.

An extensive pyloric resection seemed advisable and this was done and followed by a Polya-Reichel repair.

On opening the resected portion of the stomach the following lesion presented itself. There was a superficial ulceration on the posterior wall crossing the lesser curvature on to the anterior wall. It was about 2 x 3 inches in diameter its right margin lying about 2 inches from the pylorus. The outline was irregular and serpiginous. The edges were somewhat elevated and thickened, but not greatly so. The floor was composed of

smooth gray fibrous tissue and was clean. The stomach wall was thickened particularly in its submucous layer. Several minute normal appearing lymph-nodes were found in the mesentary. The small tumor felt on examination and thought to be an enlarged lymph-node proved to be a fibromyoma of the small intestine. This was excised.

The microscopical report on the stomach lesion made by Symmers was as follows:

"Microscopic examination shows the presence of a simple ulcer without evidences of tuberculosis, syphilis or malignant transformation. The tubules at the edges of the ulcer are hyperplastic and some of them are of the immature type. The base of the ulcer is lined by necrotic tissue, scattered through which are numerous polymorphonuclear neutrophiles and immediately under which are numbers of round cells of the lymphocytic type, imbedded in which are a few thin-walled blood-vessels. Immediately beneath this layer the muscle tissues are extensively replaced by scar tissue in which are moderate numbers of capillary vessels and arterioles, some of which are surrounded by a mantle of plasma cells. (Figs. 14 and 15.)

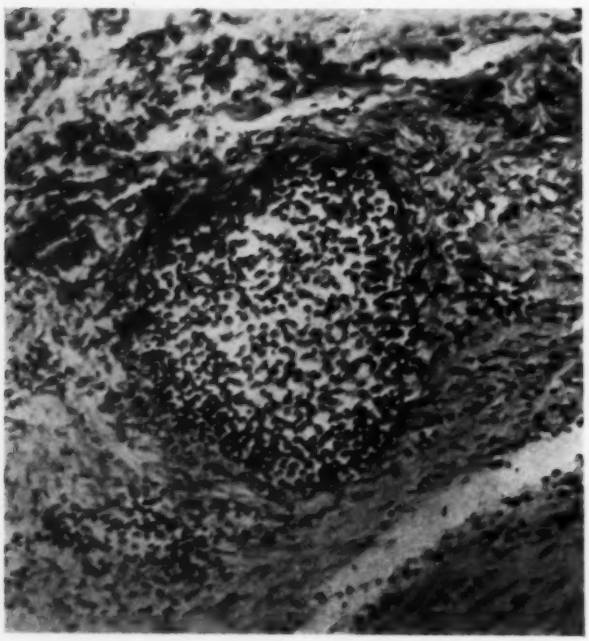

FIG. 11.—Brams and Meyer's case from Surgery, Gynecology and Obstetrics, 1923, vol. xxxvii, pp. 127-133.

"Sections stained by the older method of Levaditi and examined by three independent observers over a long period of time, fail to show the presence of spirochætes. In fact, there is nothing in the histology of the ulcer to suggest syphilis."

The patient made a prompt recovery, and now January 14, 1925, is free from all symptoms. She is receiving antiluetic treatment but the Wassermann is four plus. She has gained very considerable weight but is not yet back to her normal.

The summary is interesting. A woman, age thirty-nine, presents a four plus Wassermann, a marked deformity of the stomach is seen by X-ray, of the abrupt infiltrating type. No free HCl in the stomach contents, with a history of intractable vomiting and gastric pain extending over a period of five months. During this time she has lost forty pounds in weight and is correspondingly weak, but she is not anæmic and is not cachectic.

The picture is identical with many of the cases reported as syphilis of the stomach. Yet on resection of the diseased portion there is no histological evidence of syphilis and the case cannot be considered to be syphilis. The histology also is identical with that in many reported cases where the reporter has ignored the facts and accepted the diagnosis of syphilis.

We have made a careful study of the detailed histories, the radiographic findings, and the chemical analyses of the greater part of the 200 cases or more reported as syphilis of the stomach where the diagnosis rests upon other

than histological evidence. Especial attention has been paid to those in which the evidence was sufficiently strong to make the diagnosis presumptively correct. This study convinces us that there are no characteristic subjective symptoms or objective findings upon which a diagnosis of syphilis of the stomach may soundly rest. The differentiation is much more difficult and much more uncertain than that between simple ulcer and carcinoma. There seem to be five principle factors that have influenced writers in making the diagnosis. First.—The positive Wassermann reaction. Second.—An anacidity or a markedly reduced HCl. content. Third.—A marked deformity of the stomach as shown by the X-ray, particularly of the "dumb-bell type," or with an abrupt margin between the healthy and the diseased portions of the stomach. Fourth.—A less marked cachexia, emaciation and anæmia than

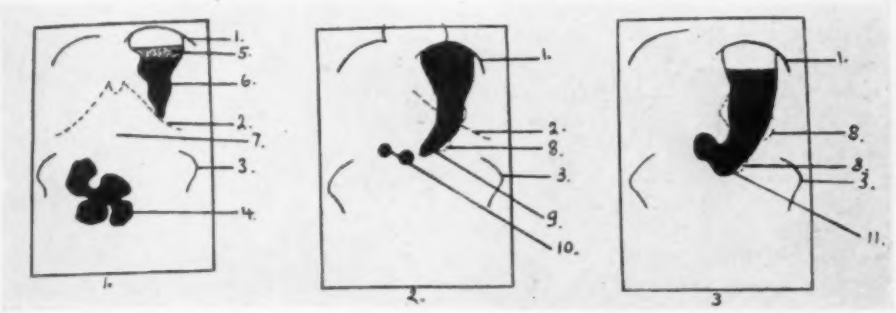

FIG. 12.—Brams and Antoine's case from U. S. Naval Medical Bulletin, vol. xviii, 1923, p. 305. This represents the use of antisyphilitic treatment in a patient who presented no evidence of syphilis and in whom the Wassermann was negative! It is not the histologically proved case of the same authors, cited in foot note on page 769.

would be found with such radiographic changes due to other than syphilitic lesions. Fifth.—Improvement under antisyphilitic treatment. It is not difficult to find ample evidence for considering all of these points as of doubtful value. (1) We have already discussed the danger of laying too much stress upon the presence of a Wassermann reaction. (2) In most of the positively demonstrated cases no report is given of a chemical analysis of the gastric content, except in those recently studied. This analysis is rarely given in any of the cases up to the time of Pappenheimer's report. Pater does not enter into a consideration of this phase. In Graham's [7] accepted cases the free HCl. varied between 3 and 6. In Brams and Meyer's [8] first case there was no free HCl. and a total acidity of 30. In their second case there was no free HCl. a total acidity of 2. In McNee's case there was no free HCl., but lactic acid was present; in the probable cases of LaFleur [22] and McNeil,[24] no acid was found in the former, and in the latter there was no free HCl. and a total acidity of 25. The low acid content is rather a constant finding in the clinically reported cases, but Smithies [43] found an anacidity in only 2 of 26 instances of dyspepsia associated with positive Wassermann Noguchi reaction. The average free HCl. of the whole group was 33 and the maximum was 110. Stokes and Brown,[41] in an analysis of 122 of their patients, found a hypoacidity in 50 per cent. and a normal acidity in 38 per cent., and yet only eight of

these cases at the most had true syphilitic stomach lesions. Other observers (Glasser [47]) have found that syphilis *per se*, without reference to the presence of the gastric lesion, tends to produce a marked hypoacidity, and finally many of the cases at first supposed to be syphilis have ultimately proved to be cancer, where, as is well known, hypoacidity is the rule. While, therefore, it is probable that true syphilitic lesions of the stomach produce, as a rule, a low

FIG. 13.—Simple ulcer of pars media and pylorica in a patient having a four plus Wassermann. Note abrupt line between normal and diseased portions. See report of case in text, page 781.

acid content, this finding is of no great value in making the diagnosis. (3) The radiographic findings have been given greatest consideration in arriving at the clinical diagnosis of gastric syphilis, and it is noteworthy that many of the papers on this subject are being written by the radiologists. Carman [44] discusses this phase of the work and comments on the opinion of Dewis and LeWald concerning the " dumb-bell type " of hour-glass stomach as being diagnostic of syphilis. He is not convinced that this deformity is sufficiently characteristic to be of great value. He names eight suggestive points in reading the radiogram.

1. Filling defect of the gastric outline, usually without corresponding palpable mass.

2. Shrinkage of gastric capacity.

3. Stiffening and lessened pliability of the gastric wall.

4. Absence of peristalsis from the involved area.

5. Pylorus gaping rather than obstructed.

6. Six-hour retention less common than in other gastric lesions (23 per cent.).

7. So-called hour-glass stomach; upper loculus expanded and bulbous, lower loculus tubular, due to extensive irregular concentric contraction.

8. Patient usually under cancer age and not ill in proportion to the extent of disease shown by the X-ray.

His summing up is as follows: "As a matter of fact, however, the röntgenologist's first suspicion of the lesion being syphilis rather than cancer, is usually aroused not by the Röntgen picture so much as by certain obvious clinical facts. There is an absence of palpable mass, the patient may be under the cancer age, he is anæmic rather than cachectic, and has not lost weight and strength in proportion to the extent of gastric involvement and the duration of the trouble."

Merril,[19] in the study of his 16 cases of probable or suggestive cases of syphilis of the stomach, says that there is a progressive course with marked loss of weight, unaccompanied by the degree of cachexia and weakness seen with cancer. Palpable tumor is uncommon. Notwithstanding these views, the cases of Flexner,[3] Pappenheimer,[4] McNee,[6] and others of the positive cases, showed very considerable loss of weight and cachexia. In many of the reports the statement is made that the patient was considered to be in the last stages of gastric cancer and operation was undertaken only as a palliative measure, or antisyphilitic treatment was instituted more or less empirically. Brams and Meyer's [8] case, and McNee's [6] case, both gave distinct palpable tumors. One may therefore be not a little skeptical concerning the ability of the röntgenologist to make a correct diagnosis of syphilis of the stomach. Differential characteristics are no more than suggestive, and Merril [19] sums the situation by saying: "Röntgen evidence is not characteristic, but is valuable in determining the location and extent of the lesion and should be used in conjunction with all other possible evidence in deducing the probable diagnosis." In regard to the fifth diagnostic characteristic, namely improvement under antisyphilitic measures, it is only necessary to refer to the uncertainty of this evidence unless it be carried over a very long period. There are records extending over such a period that are of true value. Among these may be named two cases of Hayem,[15] where the patients were brought from a state approaching death to perfect health and continued so for periods of many years, one approximately thirty years; several of the cases cited in Downes and LeWald's [20] original report and subsequently reported upon two and three years later by Downes.[20] Downes has been good enough to give me recently (December, 1924,) a final report on these cases.

CASE I.—That of a congenital syphilitic, is perfectly well at the present time. A gastro-enterostomy was done when she first came under treatment, and its influence in restoring good health must not be overlooked. The histology of a piece of the stomach wall at operation was suggestive but by no means positive of syphilis. Case II.—Died in 1920, six years after the gastro-enterostomy; his physician stated that the symptoms were suggestive of cancer of the stomach. Case III.—Died of cancer of the lip and pulmonary tuberculosis in December, 1917, and the autopsy was performed by Ewing from whose protocol the following is a quotation:

"Opening from the inferior curvature of the stomach 6 cm. from the pylorus is a gastro-enteric fistula 1½ cm. in diameter. (Gastro-enterostomy stoma.) Pylorus much contracted exactly at pyloric orifice apparently running over into the duodenum. Here there is a defect in the mucosa reaching down to the muscularis 1½ cm. long, about which the tissues are fibrosed and deeply injected. Microscopical examination.—Sections from the pyloric mucosa and wall fail to show any definite scar of an old ulcer. The glands have been superficially removed by post-mortem digestion and trauma in some places, but no mucosal defect is found. There are occasional islands of atypical hypertrophic glands, and the mucosa is generally thin. At one point the muscularis mucosa is disordered and gastric gland alveoli appear deeper than normal over Brunner's glands. There is a diffuse interstitial myositis throughout the indurated area, with considerable replacement of muscle fibres with tissues."

FIG. 14.—Section at border of ulcer in case reported in text. See page 782.

This lesion may well be the remains of syphilitic disease, but it equally may be the remains of a simple ulcer which had healed because of the gastro-enterostomy. Cases V, VI and VII are reported as well during the year 1923, eight, ten and nine years respectively, after the original report, and Case VIII was reported as well in 1920, six years after the first report. To sum up; of the eight cases one apparently had cancer of the stomach, one died of cancer of the lip and pulmonary tuberculosis with the stomach findings above given, and a third died of acute Bright's disease. The remaining five are in good health, but two of these received the benefit of a gastro-enterostomy, and this must be given due weight in determining the cause of their present good health. The other three are good examples of patients with a positive Wassermann and deforming lesions of the stomach who have remained in good health over long periods under antisyph-

ilitic treatment. There has been some but not striking change in the radiogram of some of these patients. (Cf. original LeWald.[21])

In contrast to the cases here cited many reports give only short periods of improvement under medical treatment, many have also received the benefit of surgical operation, and many after the initial improvement have subsequently died of cancer or other lesions of the stomach. Obviously such cases present no therapeutic test on which a diagnosis of syphilis of the stomach can properly be based. The most emphatic testimony against the placing of too great value upon the therapeutic test is found in the observations made by Chiari concerning changes in the stomach in the presence of syphilitic disease, which in no sense may be called syphilis of the stomach. The clinical testimony of Stokes and Brown, of White, and of others, adds emphasis to this. There can be no question that syphilitic patients suffering either from cancer or from simple ulcer of the stomach would be greatly benefited by a course of anti-syphilitic treatment, and this benefit would conceivably extend over a very considerable period. This, however, would not justify one in more than suspecting that the patient had a true syphilitic lesion of the stomach.

FIG. 15.—Microphotograph of simple ulcer reported in text (page 782). The changes are those so well described by Turnbull and are not characteristic of syphilis.

The importance of differentiating between "true syphilitic ulcer" and "ulcer in syphilitics" is thus manifest. If future reporters will endeavor to make such distinction and will only publish well-supported cases, we are firm in the belief that the discrepancy which now exists between the number of those cases which can be proved histologically and those cases which are presumptively positive from clinical evidence only, will no longer exist.

A careful study of the accurate pathological descriptions given by Chiari,

Flexner, Stolper, Pappenheimer, and McNee, on cases coming to autopsy, and by Brams and Meyer on operative specimens, would arouse skepticism in the mind of any operator when the pathological report on portions of the removed stomach fails to give very positive evidence that the causal factor is syphilis. It was on the basis of such a study that our one case was excluded in spite of the overwhelming clinical and gross evidence that it was true syphilitic ulcer.

From the educational standpoint, the necessity of such careful study will be apparent to anyone who will read the description of syphilis of the stomach given by Mills [45] in Nelson's *Loose-Leaf Medicine*. From the description there appearing the reader must draw the conclusion that syphilis of the stomach is a common disease, that its manifestations from every viewpoint are fully understood, and that the diagnosis rests upon as sound a basis as that of any frequently observed and distinctly differentiated pathological condition.

My appreciative thanks are given to Doctors Symmers, Ewing, and L'Esperance for their pathological studies and to Doctor Dudley for aid in reviewing the literature.

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DUODENO-JEJUNOSTOMY

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Although duodeno-jejunostomy is now a well-recognized surgical procedure it is still of sufficient infrequency to justify the reporting of all that may be performed until the indications for, and the contra-indications against it, are more definitely established. The two following cases illustrate a successful and an unsuccessful result following this operation. Both were considered to be suffering from chronic mesenteric ileus before operation.

Case I.—Mrs. A., Hospital Number 12012. Age thirty-seven years, white, married, was admitted to the Brooklyn Norwegian Hospital, December 22, 1923, suffering from pain in epigastrium, vomiting and belching of gas.

Family history is negative as to chief complaint. During adolescence she suffered a good deal from "bilious attacks." She has been married fifteen years. She has one child, a girl of twelve years. She has never had a miscarriage. Following her delivery she developed a pelvic peritonitis. She does not suffer from constipation.

Her present complaint began fourteen years ago with attacks of vomiting, epigastric pain and sour eructations, together with the belching of gas. The attacks would appear from three weeks to four or five months apart. Between attacks she feels perfectly well. The attacks come on at any time and have no relation to meals. The pain is located about one inch above and to the right of the umbilicus. The pain is steady and knife-like in character and does not radiate. The duration of an attack in the past may vary from several hours to one and one-half days. The attacks are never accompanied by hæmatemesis or bloody stools. The present attack has lasted for thirty-six hours. The ingestion of food has brought no relief. She states that the attacks cease just as suddenly as they appear and apparently nothing she does can prevent an attack from coming on. She has been on a very carefully established diet and has slept with the foot of her bed elevated for the past two years, during which time she gained fourteen pounds in weight, but her symptoms still persisted.

Her abdomen was well developed and has a normal amount of fat in the subcutaneous tissues, and was symmetrical. There is a tender point covering the size of a fifty-cent piece located about one inch above and to the right of the umbilicus. There are no masses to be felt in the abdomen and there is no abdominal rigidity present. Pulse, temperature and respirations are normal.

Laboratory Findings.—The urinalysis is normal. Blood count: red blood cells 4,240,000; white blood cells 6760; hæmoglobin 74 per cent.; polymorphonuclears 73 per cent.; small lymphocytes 22 per cent.; large lymphocytes 5 per cent. The analysis of her gastric contents was within normal limits for total acidity and free hydrochloric acid. There was no blood present in the gastric juice. X-ray and fluoroscopic examination shows a dilatation of duodenum. Patient was admitted to the Norwegian Hospital and prepared for laparotomy. Operator: Dr. Henry F. Graham. Mayo incision. On entering the peritoneal cavity a dilated stomach and duodenum presented itself in the wound. The duodenum was found to be dilated to a point corresponding with the root of the mesenteric vessels. The jejunum was collapsed. Running through the root of the mesentery was a distinct tense band. Her gall-bladder appeared normal. No evidence was found of

gastric or duodenal ulcer. The stomach was tonic. The appendix appeared atrophic and was removed. The right kidney was prolapsed about one inch. The right ovary was small and cystic and there was a small fibroid present on the posterior wall of the uterus. Duodeno-jejunostomy was done between the second portion of the duodenum and the first portion of the jejunum without the use of intestinal clamps by the suture method. The post-operative course was unusually smooth for a patient of her type. Stomach washings were never indicated. Saline was given for two days per rectum and water was allowed as soon as vomiting ceased. The diet was increased daily and the patient was eating a milk, cereal and vegetable diet when she left the hospital on the twenty-first post-operative day.

FIG. 1.—Dilated duodenum.

The after course has been very smooth and uneventful. There has been a steady gain in strength. There has been no nausea, pain or vomiting since operation. The weight has increased seventeen pounds. The patient was last seen on October 12, 1924, nearly ten months after operation.

CASE II.—Hospital Number 12104. D. H., female, age, twenty-four years, married, was admitted to the Norwegian Hospital, January 4, 1924 because of persistent gastric irritability and abdominal discomfort. She has been troubled for a long time with constipation and has much pain on defecation. She has never been jaundiced. She has been obliged to urinate once or twice at night but has never had any blood in the urine or burning on urination.

Present Illness.—For twelve years, following an attack of scarlet fever, the patient has suffered from attacks of nausea and vomiting. These start with dizziness, frontal headache, pain over one eye and vomiting. They last from several hours to a day and formerly came about once a week but had gradually become less frequent and the interval had even become six months before she became pregnant. During pregnancy she had a stormy time with a great deal of nausea and vomiting. Two years ago she was told by her physician that she had appendicitis and at the present time she complains of tenderness in the right lower quadrant.

Since her confinement, with gradually increasing frequency she has been subject to periods of inability to retain food. Vomiting would occur either immediately or as late as two hours after meals and would last for days at a stretch. There has been no particular relationship to the taking of food. Sodium bicarbonate formerly gave relief but does so no longer. Eating does not bring relief. At present constipation is not a troublesome symptom. There has been no belching of gas but she has had occasional eructations of sour fluid. She was sent to the Norwegian Hospital by her physician with a diagnosis of chronic appendicitis and retroversion of the uterus.

When admitted the abdomen was concave and soft. There were no masses to be felt. There was moderate tenderness felt at McBurney's point. Vaginal examination showed a moderate sized, retroverted uterus.

X-ray examination by Doctor Masterson showed the stomach to be of the hypotonic type, lower border being three inches below the crest of the ileum, in the upright position. Peristalsis is poor. There is a seven hour residue. The cap is visualized and is normal in size. The descending and transverse portions of the duodenum are dilated to a point four inches below the cap. This is more or less constant in all exposures but is best seen in the upright position.

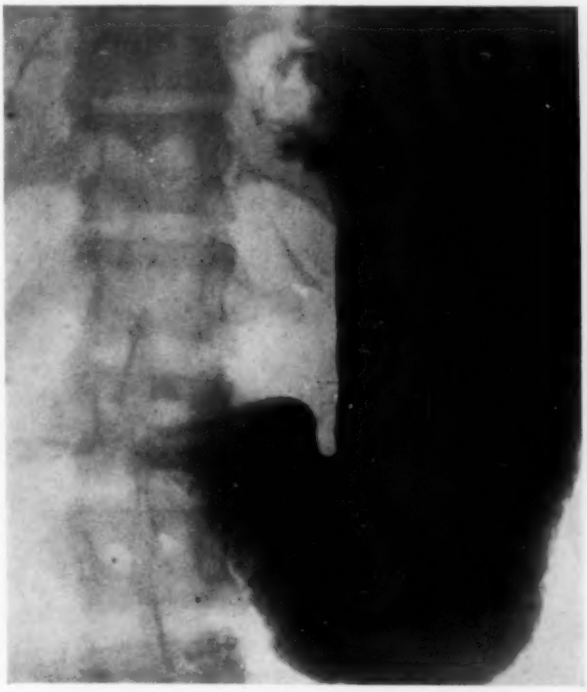

FIG. 2.—Illustrating pyloric obstruction following duodeno-jejunostomy.

On the day of admission she had some epigastric distress and lower abdominal pain. The following day she vomited undigested food one hour after eating. She vomited several times on the third day. An operation was performed on the fourth day.

Operation. Duodeno-jejunostomy and Appendectomy.—Through a six-inch right rectus incision opposite the umbilicus a careful exploration of the right upper abdomen was made. There was no ulcer of the stomach or duodenum. The gall-bladder showed a band from the cystic duct to the region of the duodenum. The pancreas was normal. There were no gall-stones, Jackson's membrane or Lane kink. The appendix which was long and flabby was removed. It showed microscopically a lymphoid hyperplasia. The uterus which was retroverted was manually replaced but not sutured in place.

The duodenum was larger than normal and bulged through the posterior peritoneum. The root of the mesentery as it passed over the third portion of the duodenum seemed somewhat tight but not so much so as in the previous case. However, when the finger was inserted under it and lifted there was considerable resistance and the bulging of the second portion of the duodenum, which had been quite marked before this, immediately disappeared.

It seemed difficult in this case to make the anastomosis without splitting the peritoneum so this procedure was first carried out and then a suture anastomosis one and a half inches long was made between the second portion of the duodenum and the jejunum a few inches from its origin.

Time of operation one hour and twenty minutes. The post-operative urine showed many hyaline casts and acetone.

There was some vomiting following operation on the same day, but none thereafter until the fifth day when the patient vomited two ounces of pale green slimy fluid. Convalescence was normal except for this single upset. There was primary union of the wound and the patient left the hospital on the twelfth day following operation.

Another X-ray examination the day before discharge failed to show the outline of the second portion of the duodenum and did show the barium passing through the anastomosis.

This patient's record after leaving the hospital will be given in her own words. "January, weight upon entering the hospital 137 pounds. Weight upon leaving the hospital 125 pounds. February, gained steadily, reached 135 at the end of the month. March, slight stomach derangement with slight loss in weight. April, period of gaining followed by a severe bilious spell.

"May, went away for a change and a rest. Was much improved and increased in weight to 134 pounds. Severe bilious attack at the end of the month. June, daily vomiting during most of the month. Had a series of stomach washes. When food was retained the washings brought it up several hours after it had been eaten. On one occasion it was twenty-four hours after." An X-ray picture taken at this time showed gastric retention, pyloric obstruction, a high duodenum and a prolapsed stomach. She was again admitted to the hospital and a second operation was performed on July 7, 1924. The old anastomosis between the duodenum and the jejunum was found patent and in good condition. The duodenum was adherent to the gall-bladder. There was a long, flaccid, atonic cæcum. The stomach was prolapsed.

The gall-bladder was removed and a posterior no-loop gastro-enterostomy was made. The after course in the hospital was quite uneventful and the patient returned home within two weeks. Since that time there have been periods of vomiting and at times attacks of mild diarrhœa. The vomitus consists only of bile-stained fluid and not of food. It is small in amount. The weight is now again 125 pounds.

We feel that her present condition is, probably, largely due to her atonic dilated cæcum. This case would be classed as a failure following duodeno-jejunostomy.

ENTERO-MESENTERIC CYSTS*

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Much has been written about mesenteric cysts—their etiology and morphologic characteristics and many cases have been reported. I desire to report an additional case which shows several unusual characteristics.

Patient was a male infant, aged five months, who was admitted to the service of Professor E. E. Graham. Chief complaint: Enormous distention of the abdomen, constipation, dyspnœa and frequent attacks of vomiting.

At birth it was noticed that the abdomen was distinctly enlarged. This enlargement gradually became more noticeable. The child cried frequently and would waken out of a sleep crying as if he was in great pain. A provisional diagnosis of Hirschsprung's disease was made. Enemas and colonic irrigations were administered. There was some symptomatic improvement in the child but no diminution in the size of the abdomen.

Doctor Manges, who made an X-ray examination reported.—"There is no doubt some dilatation of the colon but there is a considerable mass or substance in the abdomen that is not colon. We suspect that there is either fluid, organized exudate or some soft tissue enlargement." The child was transferred to the surgical service of Professor J. Chalmers DaCosta, and an exploratory opening of the abdomen was made under ether anæsthesia, by Doctor Shallow, assisted by Doctor McCarthy.

The median incision exposed a cyst which reached into the pelvis and extended upward to the diaphragm. It was impossible to deliver the mass. A large trocar was introduced and 1500 c.c. of clear amber fluid evacuated from the cyst. The mass and the intestines were then delivered. It was observed that the cyst was in direct contact with the intestines at the mesenteric border. The intestines were spread along the outer layer of the cyst, like a ribbon, causing chronic obstruction. Because of the large size of the cyst no attempt to remove it was made, but only to resect the portion of intestine which was incorporated in the cystic mass. A clamp was applied to the small intestine, four inches from the ileo-cæcal junction. This point marked the lower margin of the cyst. A second clamp, 40 cm. (see laboratory report) above the first, was applied. The vascular supply was ligated in sections. The bowel and cyst were extirpated. The intestines were joined by end-to-end anastomosis made by Connell's suture. The abdomen was closed without drainage.

The patient reacted well from the anæsthetic. There was surprisingly little shock. The pulse never rose above 130. The following day the temperature rose to 103°, the pulse to 160. There was no vomiting. The patient passed gas after an enema. The next day the temperature rose to 106°, otherwise the child did not seem to be seriously ill. He died suddenly at three o'clock the following morning.

The post-mortem examination made by Doctor Crawford did not show in the abdominal cavity any cause for the fatality. The lungs showed some hypostatic pneumonia.

Pathologic Report.—The specimen consists of an elongated hollow mass measuring 45 cm. in length and varying in diameter. The larger portion measures 14 cm. in diameter. At the other extremity it measures 6 cm. in diameter. The average thickness of the wall is 4 mm. There are several constrictions in the cavity but each cavity of the mass is in communication with the other cavities. Both the external and the internal surfaces

* Read before the Philadelphia Academy of Surgery, January 5, 1925.

are smooth. The specimen was emptied of its contents. A portion of the small intestine, 40 cm. in length, is attached to the external portion of the specimen, but there is no communication between the lumen of the gut and the cavity of the specimen. Section from the wall of the cyst shows it to be composed of three coats of non-striated muscle—an outer longitudinal, a middle circular and an inner longitudinal. It is partially covered by a serous coat and is lined in parts by columnar epithelium. In some portions of the wall, the three muscular coats are not as distinct as in others, but in certain areas the two outer coats are about the same thickness, but with a much thinner inner coat. The epithelial lining is not constant but in places the columnar cells are several layers thick and some of the cells appear to be ciliated.

FIG. 1.—General abdominal distention caused by entero-mesenteric cyst.

Concerning the etiology of this true mesenteric cyst, there can be no doubt. The microscopic findings stamp it, without question, a part of the small intestine. Dowd[1] in his classical article attributes a number of cases, quoted by him and which contained elements of intestinal structures, to sequestrations or diverticula from the intestine.

Ayer[2] expanded on the view that some mesenteric cysts are of intestinal origin and are the result of snared-off portions of atypical diverticula. He

quotes sufficient authority to show that congenital diverticula of the "intestines are not uncommon"; but the direct conversion of a diverticulum into a cyst is not explained.

Macauley [3] quotes a series of cases of what he calls "Congenital Ileo-cæcal Cysts," in which the cysts were in the lumen of the intestine. Inasmuch as this case of mesenteric cyst and some of the cases quoted by Dowd and

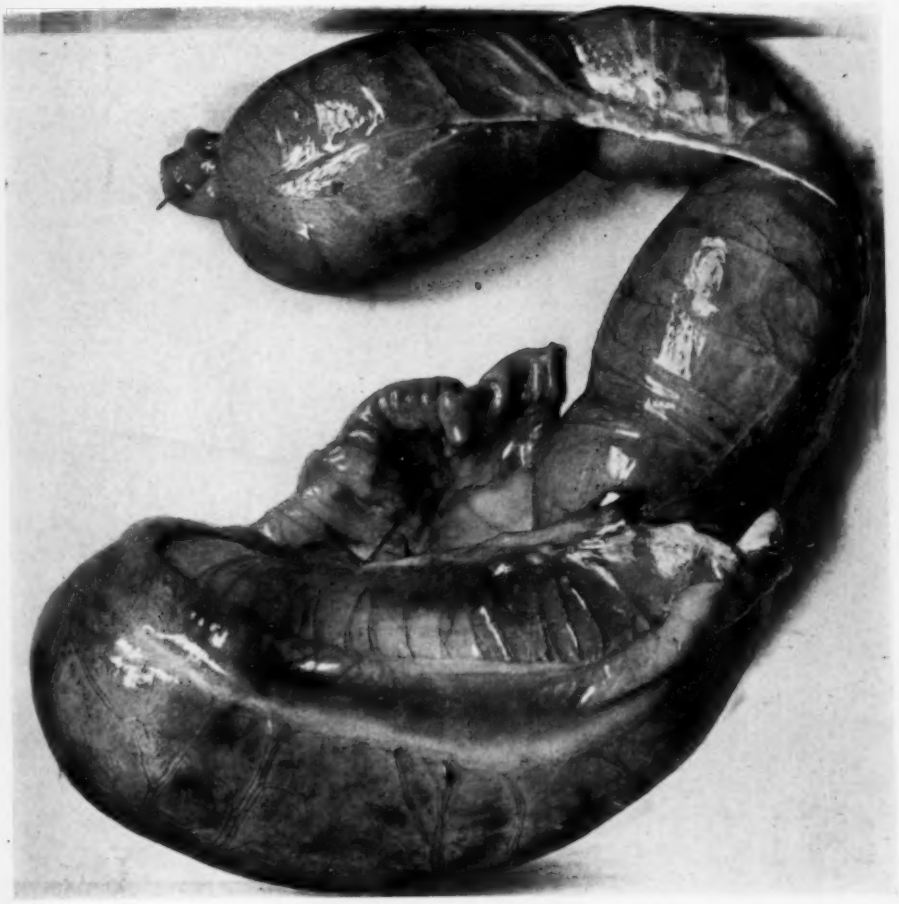

FIG. 2.—Cystic mass, with portion of ileum removed.

Ayer were in the ileo-cæcal region, one is struck with the question: Are both types the result of the same causative factor?

The series of cases reported by Macauley are of distinct importance, they definitely show that cysts may and do originate in the intestines; they show their persistent attachment to the site of origin of the cyst, ileum and cæcum, they show various phases of evolution, occurring in the interior of the bowel from true enteric cysts, a cyst associated with a diverticulum (Ayer's case) and diverticulum alone (Baldwin's case).

Let us ask ourselves what connection has an enteric cyst with a mesenteric cyst and an intestinal diverticulum.

Keibel and Mall discuss vacuoles (diverticulæ) in the jejunum and ileum (Human Embryology). They say: "The lower portion of the small intestine never presents a subdivided lumen such as is found in the duodenum, but its epithelium contains scattered vacuoles, which develop in a very characteristic manner. These vacuoles occur chiefly along the portion of the intestine found within the umbilical cord, and they are situated along the convex surface of the intestinal coils, opposite the mesenteric attachment.

"The intestinal vacuoles are first indicated by a concentric arrangement of the basal nuclei, and in this stage they have been described as 'buds' or 'pearls.' In the centre of such a bud a small cavity can often be detected. In later stages the cavity communicates with the intestinal lumen, and the bud forms a knob-like basal projection. These projections often have a somewhat constricted neck, and the overhanging portion may become asymmetrical, extending aborally along the intestine. Four of the thirty-two diverticula in the 22.8 mm. embryo project aborally. One diverticulum, longer than any of the others, extends laterally so that its tip penetrates the dense mesenchyma of the muscularis. Usually they are in close relation with the epithelial layer, and they cause no disturbance in the course of the circular muscle fibres. In older embryos the folded appearance of the epithelium renders the detection of the diverticula more difficult. It is probable that, by the enlargement of their necks, some of them are incorporated in the general epithelial layer. Others, however, retain their identity. One of these was found and modelled by F. P. Johnson in an embryo of 134 mm.—a stage when the villi are well developed and the intestinal glands are being formed. Some of the glands open into the base of the diverticulum. Around it the mesenchyma is dense and suggests the formation of lymphoid tissue. This is apparently the oldest embryo in which such a structure has been found, and they are not known to occur after birth."

FIG. 3.—Low power showing the three coats of the cyst and the epithelial lining.

It is said that the vacuoles, buds and diverticula described above originate in the small intestine opposite the mesenteric border, but nothing is said about

vacuoles appearing in the cæcum (a location of some of the enteric cysts and Baldwin's diverticulum).

Is it not possible that vacuoles, similar to those found in the small intestine, may exist also in the large intestine?

I believe this work of Doctor Lewis, set forth in the text-book on "Human Embryology" by Keibel and Mall, and the work of Dr. F. P. Johnson on vacuole diverticula, in the same book, enable us to decide as to the bases of the various forms of cysts found in the ileo-cæcal region. There are at least three types of vacuole diverticula described (1) the superficial type which attains its maturity as the bud or pearl; (2) the aboral type which undergoes various changes and in all probability invades the deeper structures of the bowel; and (3) the penetrating type which penetrates the mesenchyma of the muscularis. Macauley in his article described a number of cysts which are attached to the wall of the bowel but hung free in the lumen. It is probable that such a type of cyst results from the persistence of the bud or pearl vacuole diverticulum in its embryonic form.

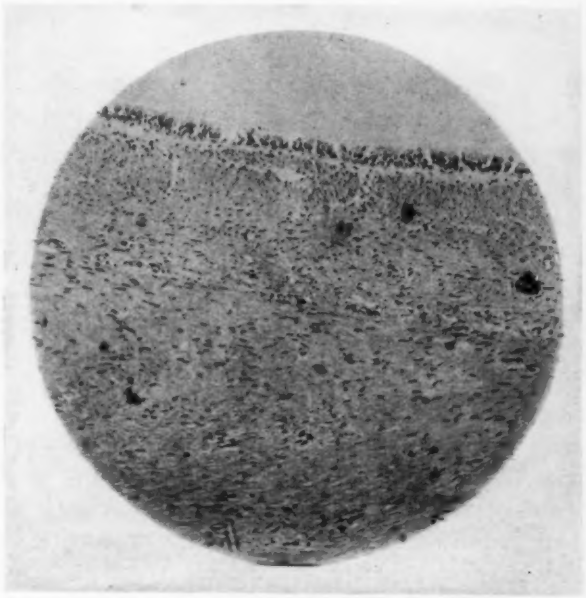

FIG. 4.—High power. The epithelial lining is distinctly shown, in some places it is several layers in thickness.

Such a case as Ayer's, which was a combination of a cyst in the wall of the intestine associated with an intestinal diverticulum, we call an entero-cystic diverticulum. It will be recalled that in Ayer's article he states that the portion of the cyst which presented into the bowel was covered by mucous membrane. This observation would lead us to the belief that the origin of the cyst was in the deeper structures of the bowel and from the aboral type of vacuole diverticulum. Probably the persistence of the embryonic vacuole led to cyst formation, which cyst, in its increasing size, formed a diverticulum along the outer side of the bowel, the cyst encroaching on the lumen of the bowel. This view is borne out by the fact that the covering on the bowel side was mucous membrane. Let it be assumed that after the cyst was well developed and diverticulum was formed as a result of atrophic change on the bowel side, the cyst had ruptured, nothing would have been found but a

diverticulum. Ayer's operation really converted the entero-cystic diverticulum into a diverticulum.

The cases of Wallman and Lewis and Thyng, reported by Higgins and Lloyd[4] in the *British Journal of Surgery* (July, 1923), in which there were a number of diverticula, could have resulted from numerous cystic diverticula which had undergone atrophic changes and permitted the cysts to drain into the bowel. We can thus account for the numerous diverticula found in that specimen. This view would also explain the case described by Baldwin in Macauley's article, in which a diverticulum was found opposite the ileo-cæcal valve in the cæcum. Keibel and Mall speak of the penetrating type of vacuole diverticulum which invades the musculature of the bowel. What would prevent a cyst, of this type, after deep penetration and increase in size, from being extruded through the muscular coats to taking up its abode in the mesentery, as illustrated in my case?

Miller's case in Higgins and Lloyd[4] probably had the same origin. It is noteworthy that pure enteric cysts seldom attain a large size. On the contrary, many mesenteric cysts attain enormous size.

CONCLUSIONS

Enteric cysts, entero-cystic diverticula, diverticula and entero-mesenteric cysts have a common origin in the vacuole of the ileum or cæcum. The word entero-mesenteric cyst is used in this report to differentiate those mesenteric cysts which arise from the Wolffian body, dermoid cysts, parasitic cysts and malignant cysts from those which contain intestinal elements.

The surgical treatment of large mesenteric cysts should be resection of a portion of the intestine with the accompanying cyst. Small mesenteric cysts may be enucleated if in a favorable situation. A cyst unsuitable for resection or enucleation may be opened, drained and stitched to the parietal peritoneum.

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TUBERCULOMA OF THE CÆCUM

HYPERPLASTIC TUBERCULOSIS

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Tissue reaction to infection depends upon several factors, of which the resistance of the individual to the specific infection, or mixed infection, the kind and the strain of the infecting organism, the amount which the individual is called upon to resist in any one period of time and the channel through which the organisms gain access to the tissues are of the greatest influence in determining the nature of the pathological process. Hyperplastic tuberculosis is conceded to result from a near balance of these factors so that this type of local intestinal reaction, usually in the cæcum or colon, is characterized by a profuse round-celled infiltration and an excessive production of the customary end results of a tuberculous infection which is being satisfactorily resisted, *i.e.*, fibrous tissue. In some cases reported, this firm tumor thus formed has resembled actual new growth so closely in size and gross microscopic appearance, as to be differentiated from it with great difficulty. In some, the differentiation has been impossible. This is the hyperplastic, scirrhus, or neoplastic cæcal tuberculosis of various French authors. Various others, Kronlein, Sachs, Czerny, Pilliett, Senn, described cases which grossly at operation or after resection, could not be differentiated from new growth, and on histological examination were considered at first as carcinoma, sarcoma, lymphosarcoma, lymphadenoma, etc. The cases, however, present a wide variation in pathological peculiarities; from those clearly tuberculous to those in which typical tubercules were absent, giant cells few, or absent, and the embryonic type of tissue predominated. Such findings, together with the oft-repeated belief which one meets that cancer and tuberculosis rarely co-exist, have led to a grouping of these tumors in a class by themselves. They vary greatly in size, clearness of definition and extent or diffuseness.

Karyokinetic mitoses and numerical increase in tissue elements are mentioned (Thoma, p. 461) as essential factors of hyperplasia. This may be brought about by infectious or chemical irritation. The process under discussion, however, is one of chronic infiltration, inflammatory, granulation tissue forming, and is therefore not typically hyperplastic. Several authors mentioned by Brunner have preferred other terms, and a general discord toward the use of the term hyperplastic seems to exist in the literature. Tuberculoma of the intestines (Nothnagel) seems most accurate, and has recently been used by others. The term implying tumor is used in the clinical and not the neoplastic sense.

This process can be clearly differentiated from the common form of intestinal tuberculous ulceration occurring in the lower third of the small gut in over 50 per cent. of patients dying of pulmonary tuberculosis, since

in the tuberculous form the mucosa is slightly or not at all ulcerated and the process begins in the deeper layers of the intestinal wall.

There occur at times multiple strictures in the small gut resulting from the healing of tuberculous ulcers, but this process also resembling it somewhat in the formation of scar tissue, is a result of healed ulceration, is distinct from that here described and is not included in this discussion.

Simple ulcerative tuberculosis of the gut less commonly produces surgical complications. The tuberculomatous type of the cæcum frequently occurs as apparently a primary focus at times in later life and before another tuberculous process has been diagnosed. It is a stenosing process in which some form of intestinal obstruction, acute or incomplete, often forms the clinical picture. It constitutes a major handicap to the patient struggling against a tuberculous process elsewhere, notably, phthisis. To such a case, nothing is more important than maintaining the efficiency of the gastro-intestinal canal, so that the discovery and relief of such a stenosis will be of great benefit. In one case I have to report, the patient volunteered the information that he could push his food intake and general improvement for a certain time, after which his gastro-intestinal symptoms developed and progress stopped. The sclerosing process is fairly well localized, is movable, the patient's resistance is often good, and surgical relief has given excellent results in operated cases.

It is possible that the modern treatment of tuberculosis, by raising the resistance of the patient to the infection, has resulted in the increased frequency of this type. In reviewing the subject from the pathological records, I find its recognition in the autopsy room much more frequent in some localities than in others, and more frequent than has been found clinically. Hemmeter found it in about 3 per cent. of autopsy cases dying of tuberculosis. Of eighty-three cases of intestinal tuberculosis in the pathological records of the Massachusetts General Hospital, 12, or 14 per cent., were of this variety. At the Lakeside Hospital in Cleveland, on the other hand, no cases have been found in the past eight hundred autopsies (Karsner). At the Cleveland City Hospital, the case which prompted this study was the only one occurring on the Surgical Service, and there were none in twenty-nine hundred autopsies. I am indebted to Dr. C. A. Hamman, of Charity Hospital in Cleveland, for the privilege of including the report of two other surgical cases of the condition. Hemmeter, and the Massachusetts General Hospital, no doubt considered a well-marked increase in fibrous tissue as comprising this type. There is no definite line drawn between such and actual tuberculoma. This accounts for the discrepancy in the findings of various autopsy statistics. The disease as hereafter discussed is considered as a clinical condition. Foreign literature shows the condition to be more often recognized both pathologically and clinically than in this country. (See later summary of cases.) It would appear that clinically the condition should be more carefully considered than has been the case.

The paucity of American material may be due to a more closely drawn definition as to what constitutes the condition. For instance, the size of

tumor may vary from a moderate thickening of the gut wall to a tumor of fist size. The latter would attract more careful clinical pathological study, while the former might be purely a theoretical problem.

Historical.—Brunner, in his extensive monograph on Tuberculosis, Actinomycosis and Syphilis of the Gastro-intestinal Canal, published in 1907, was able to collect one hundred and ninety-eight cases of "tuberculous ileo-cæcal tumors" for analytical study. Of this number there were but six reported from this country. The French author, Corbin, in 1831 in an extensive study of the surgical problems of intestinal tuberculosis and especially of stenoses and perforations, first described the scirrhus form. Much that Corbin and Andral set forth has been redescribed as new. Virchow wrote, "was vor 5 Yahren publiziert ist, existiert nicht mehr." They described the stenotic symptoms and the pathological anatomy peculiar to the condition calling it a "scirrhus degeneration." These authors agree that its pathological peculiarity is characterized by a diffuse distribution of the reaction through the intestinal layers so that but two layers are apparent. The mucous membrane and subserosa stand out as the prominent structures of the cæcal wall. A marked small cell infiltration "une filtration embryonnaire enorme," which gives the tissue the appearance of genuine sarcoma, was pointed out by them as well as (1891) by Hartmann and Pilliett. The similarity of the process to actual tumor formation and the difficulty of differentiating between it and new growth, both clinically, and at times histologically, was clearly described by Gussenbauer (1880), Czerny and Suchier. The American literature on the subject includes but a few reports included in Brunner's monograph, namely those of Senn, Carstens, Harris, Beck, Lartigau, Cullen, Dowd, and possibly others, and about the same number appearing since 1907, reporting about twenty cases. English literature is more brief, but two cases. This is hardly commensurate with its pathological frequency and surgical importance. A comprehensive view of the subject will be found in the contributions of Corbin, Brunner, Hartmann, Pilliett and Lartigau.

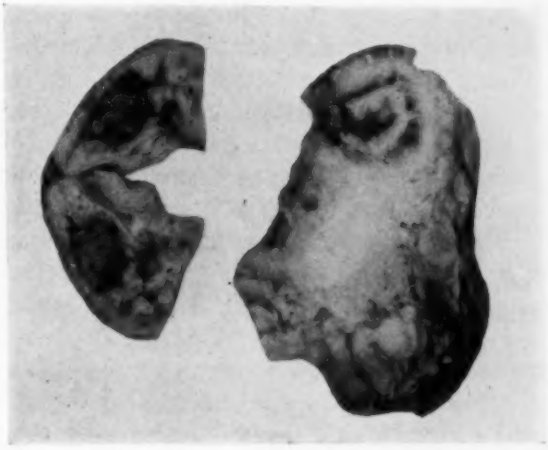

FIG. 1.—Section of the cæcum. Normal thickness. Note the cavitation in the tip of the appendix mentioned by Conrath, described by him as presenting a segmentation with several cavities along the appendix.

Etiology.—Etiologically the problem of primariness of the cæcal infection at once presented itself. Although the cæcum and ileo-cæcal valve form an intestinal stagnation point and it is easily conceived that bacilli swallowed by a phthisical patient or in infected milk might start a focus here after

passing through the mucosa (Conrath), yet the work of Margarucci, who first proved the circulatory transmission to the gut, Arloing, Krogius and finally, recently Calmette, have proven beyond doubt that in practically all cases the infection which causes the reaction reaches the cæcum through the circulation. The long contention regarding the course which the tubercle bacillus follows to the tissues, where it produces its greatest reaction, appears to be settled by Calmette's conclusions:

1. The bacillus passes through a mucous membrane, usually of the gastro-intestinal canal without injury to the mucosa.

2. It lodges in the regional lymph-spaces in the intestinal wall and glands.

3. It may be dormant or proliferate, becoming a depot of infection and, with tissue reaction, a lesion.

4. This lesion may rupture through the mucosa, producing a typical funnel-shaped or undermined tuberculous ulcer or rarely (and the subject of this discussion) with greater tissue resistance, scar-like tissue may result even to gross tumor formation. (Conrath, Cumston.)

5. With or without this local reaction the bacilli may be carried thence by leucocytes, or free in the lymph current to the thoracic duct, the right heart and the lungs. If they pass through the lungs, they lodge in the tracheo-bronchial lymph-glands, or are distributed by the arterial supply to various parts of the body (Calmette). When distributed to the intestinal wall they produce the same lesions described in 3, these being secondary and considered by the above authority to be the fact in *all cases*. Hartmann distinguished two locations for this reaction, the submucosal and subserosal; the muscle layers lying between them. Whether or not the submucosal is more likely primary, and the subserosal process secondary to circulatory transmission, may be still open to question.

There is evidence upholding the hypothesis that the tuberculomatous process in the cæcum, if not primary, is added to by local factors.

1. The cæcum is a stagnation point in the gut where constant reinfection occurs. (Conrath.)

2. After passing through the alimentary canal, the organism has decreased in virulence, hence a local reaction is able to resist it and hence the tuberculomatous type of reaction.

3. Calmette points out that the most vascular parts of the intestines are most commonly affected by tuberculosis, *i.e.*, first, the mid-ileal, and second, the ileo-cæcal region, hence the infection is more readily carried here through circulatory channels. This form, however, is extremely rare in the ileum (only nine cases reported), while ulceration is common (50 per cent. of tuberculous fatalities).

4. Conrath further noted the location of the lymph-glands close to the posterior cæcal wall between the layers of its mesentery, and showed how easily the cæcal wall became infected from them by matting together and continuity. Wieting believed this glandular involvement secondary to the cæcal.

5. The presence of a mixed infection from the stagnated cæcum necessarily adds to the inflammatory reaction.

Considering, on the other hand, all the recent experimental and clinical evidence proving the circulatory transmission of tuberculous infection from foci and knowing that in tuberculosis of the bones, joints and meninges, this is the only method of its transmission, we must accept even in this attenuated tuberculomatous process that the organism travels to the cæcum through the circulation and that local conditions favor the particular type of process.

Pathology.—The gross appearance is characterized by a relatively small cæcum of a purplish-red color with some plastic exudate without tubercles, and its wall in some places greatly thickened, possibly one to five centimetres. In a few cases reported by Conrath there was a localized patch of cæcal wall greatly thickened, fairly circumscribed. The ileo-cæcal valve, even a part of the lower ileum, is usually included in the process and may be reduced to the size of a probe. The scirrhosis may extend along the colon for a variable distance, in a few cases into the ascending, transverse and rarely to the descending colon. The mesentery is thick, short and contains large glands, becoming matted together. In some cases mentioned by Brunner, the mesenteric lymph-glands of the cæcum have not been involved. The same process is described in the pyloric antrum, or at the pylorus, and is in fact more common there than the ulcerated form. (Brunner collected twenty cases.) It is suggested as possibly more frequent than syphilis as the cause of strictures of the anal canal, especially in the colored race, and that in these cases so frequent amongst this race, tuberculous hyperplasia may be the real cause of the stricture or a combination of tuberculosis and syphilis. Sourdille showed this to be the case, and Lapointe collected nine cases of stenosing tuberculous proctitis. The point will bear further collection of cases. The well-known overgrowth of scar tissue in these rectal strictures may be favored by a tuberculous and mixed infection. In the author's service at the Cleveland City Hospital, pathological examination of three syphilitic rectal strictures has failed to show a tuberculous factor. In but nine reported cases has it involved the small gut only. The appendix is large, faintly segmented in appearance, closely adherent to the cæcum with markedly thickened walls, and showing an alternate cavitation and constriction of its lumen. (Conrath.) The appendix is, however, often entirely free from the disease (Brunner), while Fenwick and Dodwell collected seventeen cases in which the appendix alone was involved. In the three cases here reported, the appendix was involved in all. The cæcum, at first movable, becomes fixed by adherence of the gut to the abdominal wall, a characteristic partially distinguishing it clinically from cancer.

The ileum above is compensatorily hypertrophied from the chronic obstruction and may or may not show the common tuberculous ulceration. This ileal hypertrophy must not be confused at operation with the tuberculous process and when resection is elected more ileum resected than necessary. This hypertrophy and inflammatory œdema renders the ileum more readily

palpable than in cancer where the ileum is described as "emaciated." (Obrastzoff.) Peritoneal tubercles are usually not visible, a fact rendering diagnosis at operation more difficult. On section, the wall is hard, scar-like gray, the mucosa either not at all or but slightly ulcerated, the various intestinal wall layers obliterated, peritoneum thick, injected, adherent to the underlying mass. Tubercles are visible on cross-section but caseation is absent, their centres being composed of fibrous tissue. This obliteration of the muscularis and fusion of the grayish dense mass with the peritoneum is the gross characteristic.

Histologically there is a huge round-celled infiltration and epithelial-cell proliferation, surrounding a zone of giant cells which are few in number, and with a centre of fibrous tissue instead of the usual caseation. Many authors speak of numerous giant cells, and this was certainly true in two of the following reported cases, but caseation, it is agreed by all, is absent. Except for the giant cells, the process may closely resemble small-celled sarcoma with which it has been confused. Both grossly and microscopically several cases are recorded where differentiation could not be made, hence the name of scirrhus cæcal tumor. The differentiation, even under the microscope, has puzzled many (Czerny, Mikulicz, Gussenbauer, Salzer, Kocher, Sachs, Koerte, *et al.*). Some of the most illustrious names in surgery are associated with this problem of the difficulty of diagnosis between cancer and cæcal tuberculosis. Czerny, in 1886, resected a cæcum for cancer and after careful microscopic study found many characteristics of new growth and tuberculosis. Billroth cited four cases considered as cancer until histological section showed them to be tuberculoma.

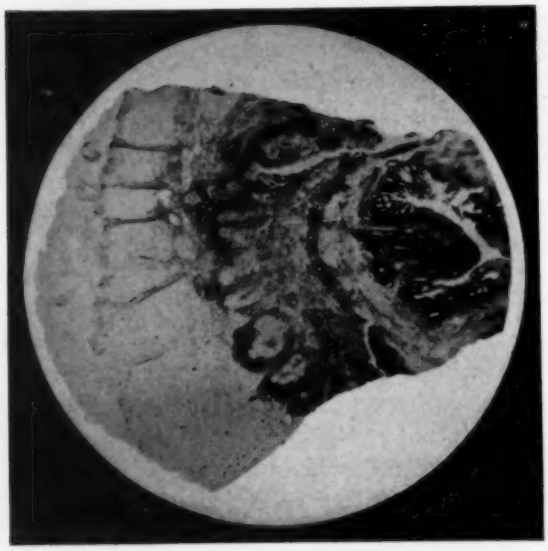

FIG. 2.—Lower power. Section through the cæcal wall.

Mikulicz, Koerte, Kocher, and Bouilly considered gross diagnosis impossible. Gussenbauer (1880) decided the presence of bacilli in the stool and lung involvement with signs of obstruction to be diagnostic evidence.

The occurrence of polypoid tuberculomas in the gut has been described, reaching even to the size of blocking its lumen. (Langhans, Caird.) Others have described the same advanced condition under the name of intestinal lupus, similar to that occurring in the larynx or on the skin. (Brunner.)

Clinical Course.—Clinical types may be divided into four groups: 1. Those

progressing insidiously, with but slight symptoms. 2. Those simulating cancer. 3. Those simulating appendicitis. 4. Those with acute ileus.

I. Such cases may go unrecognized and give to the patient discomfort, to which he becomes more or less accustomed. The symptoms of tuberculosis elsewhere may mask those referable to the abdomen. They present but slight intestinal symptoms of bloating, distention, slight fleeting abdominal pains more or less localized in the right iliac fossa, though often irregular throughout the abdomen, and grouped under the general heading of "intestinal indigestion." An occasional vomiting and possibly visible active peristalsis may be present. Periodic diarrhœa with mucus and occasionally a small amount of blood in the stool may occur. This intestinal condition favors the accumulation of fluid and gas in intestinal loops, which being pressed upon by the hand, passes through a stenosed portion of the gut with gurgling, or as Konig describes "a musical tone." Periodic incomplete ileus may often occur, responding to the patient's habit of cathartics, and very slow to become complete. Such a group of symptoms has been described as carrying over a period as long as twenty years, terminating in ileus and operation. (Benoit.)

Entirely distinct from the above-described group should be remembered those presenting incomplete intestinal obstruction with free peritoneal fluid, with moderate distention of the entire abdomen, with alternate areas of dulness and tympany throughout the abdomen with the general doughy feel to the abdomen, are typical of tuberculous peritonitis. The entire small intestine may in such cases be included within a plastic mass, held snugly against the mesenteric attachment, so that the hand introduced into the abdominal cavity finds no loops of gut at all, only a smooth, football size mass with free peritoneal fluid about it. Such is recognized as peritonitis occulsa. It somewhat simulates the massive hernias through a para-duodenal fossa. The latter, however, shows no inflammatory reaction typical of tuberculosis.

The above-described group of cases has been diagnosed as subacute or chronic appendicitis, duodenal ulcer, obstruction due to inflammatory bands, subacute or chronic inflammatory pelvic conditions in women, and actinomycosis or syphilis. When a definite tumor mass is found in the right iliac fossa ectopic kidney, retro-peritoneal gland tumors, appendicial abscess, cancer of the cæcum, have formed the type of errors in diagnosis.

X-ray would be diagnostic of the obstruction, while laboratory agenda such as the finding of tubercle bacilli in the stool with the diazo reaction and usual blood counts showing a lowered red count and hæmoglobin and a relative lymphocytosis, would be of value.

The error, in by far the largest number of mistaken diagnoses in tuberculosis of the cæcum, is in considering them either cancer, appendicitis or ileus, the true condition being found at operation.

II. It is true that cancer of the cæcum usually gives less clinical signs than those above described, but in some cases, alternate diarrhœa and constipation with a small amount of mucus and blood in the stools with definite abdominal symptoms, with loss of weight, and secondary anæmia, occurring

past middle life, cancer has been the common diagnosis. The entire course in tuberculoma is slower than that in cancer. Such cases have been resected for cancer, there being none of the gross evidences of gross tuberculosis present.

III. A third group, *i.e.*, those simulating appendicitis with abscess, should be given special notice because of the relative frequency of the error involved. Occasionally a patient may give a history of general abdominal pain, more or less localized in the right iliac fossa with vomiting, constipation and very slight fever. Such a patient may be well nourished and give a history further of two or three or more preceding similar attacks. The clinical picture is that of appendicitis with an inflammatory omental mass or an abscess, and operation has been done on several (Michon, Berger, authors) such cases, afterward reported cæcal or appendicial tuberculosis. Certain factors might counsel caution, *e.g.*, a previous history of pulmonary tuberculosis perhaps of slight degree or exposure to tuberculous infection. Possibly the patient has been a great milk drinker from non-tuberculinized herds and a longer period of indefinite intestinal symptoms may have occurred. A latent history of bloating, interim colics, diarrhœa or symptoms of group two, may be elicited after careful questioning.

The leucocyte count may be found low for such a mass of appendicial origin or the presence of pus, and a differential count on suspicion will give a relative lymphocytosis. Under such conditions a case of group three, simulating appendicitis would be suspected, and operation deferred if the conditions warranted for more accurate evidence from the X-ray and laboratory and until the patient's general condition and preparation for operation could be more carefully arranged.

IV. Occasionally patients with this disease have passed through the above-described group stages. Possibly the process has been rapid, or the symptoms not definite, or resistance and general health good (as in my case). Such may first present themselves with acute ileus.

The cases simulating appendicitis and ileus, either partial or complete, furnish the large number of diagnostic errors, and many no doubt have not been sufficiently worked up. It is during the routine of clinical work that the unusual cases are overlooked. Histories taken by the less experienced are so reported to the chief that the variations which would suggest to him something unusual in the case are, unknowingly, omitted. Thus, general abdominal pain becoming localized in the right iliac fossa with vomiting and possibly a mass may mean but one thing to the younger student, but to another the repetition of the attacks with severity over one or more years; slight evidence of incomplete ileus; the failure of the symptoms to entirely clear up between attacks, the persistence of lesser distress and pain, and the history or evidence of other tuberculous focus, would counsel delay for further study.

Diagnosis.—The positive diagnosis is made upon the following group of symptoms and clinical signs:

I. Symptoms mentioned as suggestive of chronic intestinal dyspepsia or stasis occurring in a young adult before forty years of age, or of longer duration than cancer in later life. (Twenty-five of thirty-four cases occurred before the age of forty years; average age thirty years.)

II. Tuberculosis elsewhere in the patient with evidence of a good resistance to the infection. Many cases are reported in which there was *no* evidence of tuberculosis elsewhere.

III. X-ray demonstration of partial intestinal obstruction or stasis at the ileo-cæcal valve.

IV. The presence of a palpable tumor in the cæcal region of egg or fist size, somewhat movable, tender, of medium consistency, not as hard as in cancer. If the tumor is adherent to the abdominal wall, it is more likely tuberculous.

V. The demonstration of pus, mucus and tubercle bacilli in the stool.

Differential Diagnosis.—Cancer of the cæcum occurs at a later age, its symptoms are of shorter duration, blood occurs more commonly and in larger amounts in the stools than in patients with intestinal tuberculosis. Obstruction occurs earlier and is complete. On palpation, a tumor is palpable in both conditions and in the early stages is equally movable. Malignancy becomes deeply fixed earlier, is firm, while in tuberculosis the tumor is of softer consistency, more tender to palpation and the gut above and below the tumor is more likely to be palpable because of hypertrophy or involvement by œdema or a similar process as above noted. The hæmoglobin is lower, emaciation more marked in cancer than in tuberculosis. A fistula is more likely to form in tuberculosis. One must remember this possibility in actinomycosis also. These distinctions are necessary because of the occurrence of tuberculoma in the cancer age in 18 per cent. of the cases later recorded. Again, cancer is well known before middle life where its differentiation from this form of tuberculosis may be of greatest difficulty.

"Individuals with well-developed progressing tuberculosis of the lungs are extremely unlikely to have carcinoma." (Schmidt.) Rokitansky noted that tuberculosis and cancer seem to possess a mutual immunity. Caird describes a case and cites other authors reporting their coincidence as well as the invasion of malignancy by tuberculosis and vice-versa.

One case here reported in an elderly woman was thought before operation to be appendicitis, at operation considered as cancer, and found pathologically to be tuberculoma. We must concur with Salzer's statement that "the fact of a symptom complex of chronic intestinal stenosis with a well movable, long-standing cæcal tumor speaks against cancer." Several other authors mention the extreme rarity of the coexistence of cancer and tuberculosis. (Salzer, Crowder, Wieting, Pollack.)

Sarcoma of the cæcum occurred in 10 per cent. of one hundred and sixty cases of intestinal tumor. (Bar.) It is more circumscribed, remains movable, is of larger size and more rapid growth than either of the foregoing conditions. There is less stenosis and early and wide metastasis. A *fecal*

accumulation might offer difficulties in diagnosis. However, its borders are not sharp, its consistency doughy. It is likely painless. It is not of as long duration and it is freely movable. Measures for its relief would be diagnostic, possibly followed by X-ray examination to show the absence of an underlying causative factor. *Intussusception* is rare in adults, of shorter duration, is characterized by blood and mucus in the stools, tenesmus and the palpation of the intussusceptum through the rectum. Bérard reports two cases of intussusception in adults in which the tuberculous hyperplasia was the cause of the intussusception. He suggests that in such the invagination is most likely an early complication of the ileo-cæcal disease.

Certain other inflammatory conditions must be differentiated. A *chronic appendicitis* walled-off by the cæcum possibly against the lateral pelvic wall, especially in a person past middle life, simulates very closely both tuberculosis and cancer. A history of one or more recurrent attacks, the absence of tuberculosis elsewhere or of definite loss of weight and lowered blood quality, the absence of tubercle bacilli in the stools, also of blood and the early fixation of the palpable mass, would rule out tuberculoma and cancer in such a patient. The author has seen two such cases in patients past sixty years of age. In one the cæcum was resected but found to be chronic inflammatory; in the other the condition was evident only at operation. In both, X-ray had shown delayed passage at the cæcum. In the one resected the blood picture was that of a secondary anæmia and there was quite marked loss in general nutrition and weight. Both made good recoveries. Hildebrand reports the finding of the tuberculomatous process at an interval operation for appendicitis in a twenty-year-old girl. Wilmanns and Conrath report cases showing a marked stenosis of the ileo-cæcal valve evidenced by the X-ray which at operation they thought best to resect when the disease proved to be chronic inflammatory in type.

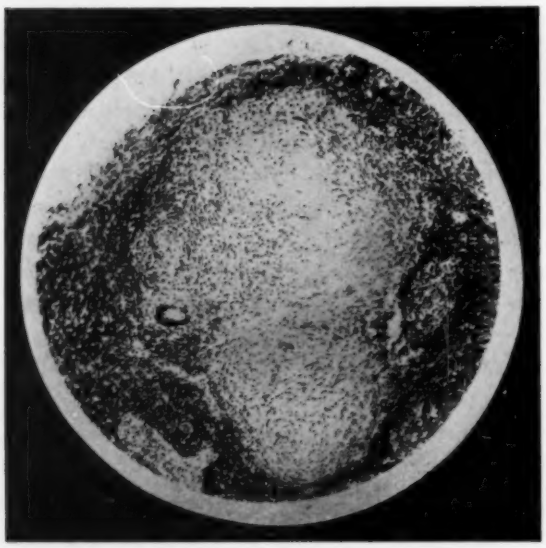

FIG. 3.—Tubercle in sub-mucosa of cæcum with fibrous tissue seen and no caseation.

Actinomycosis having the cæcal region as its point of election in the intestinal canal, rarely forms a gross tumor, readily forms an abscess, and fistula from which sulphur colored bodies are discharged.

Of extra-cæcal causes of tumors which have been confused with cæcal tuberculosis, *ectopic kidney* is mentioned by several authors. Czerny,

Kronlein, etc. It seems strange that none of these authors took advantage of ureteral catheterization and X-ray to make the differentiation. The author has found that a coin over the tumor and pyelography renders an absolute diagnosis in such problems. A *gall-bladder* offers little difficulty since the history, its descent on inspiration, the blood examination for icterus or the urine for bile would conclude the differentiation. An omental tumor, retro-cæcal glands, a burrowing cold abscess or an abscess from osteomyelitis, would show none of the intestinal symptoms nor cæcal X-ray peculiarities, while X-ray would in many cases of the latter two conditions, show bone disease.

One should at operation distinguish between the common tuberculous intestinal ulceration and the process under discussion. Resection in the former should not be done unless by partial or complete healing, stricture has formed.

In those cases in which the hypertrophic process is found confined to the appendix, or as reported by Conrath, occupied a patch on the cæcum, a simple resection sufficiently wide of the disease will suffice.

Treatment.—The indications in every surgical procedure are, first, the prevention of mortality, both from disease and surgery; second, the removal of diseased tissue or the correction of perverted function or deformity.

The treatment of tuberculoma of the cæcum may be outlined as follows:

1. Poor surgical risks, handicapped because of

A. Extensive tuberculosis elsewhere, *e.g.*, pulmonary or pleural, bones or joints, tabes mesenterica, or peritonitis.

B. Toxæmia, associated with tuberculosis in one of the above locations, but of a mixed infection origin. Mayo has remarked: "The septic factor in tuberculosis is the most important factor." In addition, a more or less crippled intestinal canal results in a toxæmia of a different type, but even more protracting because of the far-reaching effect of intestinal toxæmia and infection. The variable temperature, loss of weight, increased pulse-rate, and anæmia all suggest these. Blood chemistry methods have shown a nitrogen retention in various degrees of ileus.

C. The anæmia of these cases is often so severe as to suggest malignancy. (Mayo.)

Before consigning a patient to hopelessness, we must recall the occasional surprises to which we are treated. A case of pulmonary tuberculosis under modern treatment may show great improvement if gastro-intestinal digestion is sufficient.

A transfusion or two at this or later stage will be of great value. This procedure, both in replacing the anæmia and combating the toxæmia, has often been crucial and exhausted toxic cases have often been seen to forthwith progress favorably. By relief of an ileus due to tabes mesenterica, we have seen the latter apparently disappear under proper therapy. The removal of a partial ileus may be a deciding factor. Complete coöperation between

patient, internist, and surgeon is necessary that the latter's measures may be used at the proper time.

In such a condition, when the immediate cause of depression is ileus catheter drainage of the small gut through a left rectus incision under local anæsthesia according to the McKinnon method is essential. With the least possible operative damage the intestinal toxæmia is relieved. In selecting the loop of gut care should be exercised to pick low jejunum or ileum, and to this end a low left rectus incision should be made. It is best to make a left instead of a right rectus incision in order to keep a clean field for later operation upon the cæcum.

In one case of ileus, in which a high left rectus incision was made by the resident surgeon, the *upper* jejunum was drained with resulting rapid digestion of the tissues by the escaping intestinal fluids. Two unsuccessful attempts were made to close the fistula; exhaustion, peritonitis, and death supervened. McKinnon speaks of using "jejunum near the origin," and I cite the above experience as a mark for caution in such procedure.

After the crisis in such an ileus has passed and the X-ray and clinical signs show an ileo-cæcal obstruction of varying degree, some form of direct attack may be followed. If a complete ileus has not been present, but an ileo-cæcal stagnation with the sign of intestinal indigestion above noted have existed for an indefinite period, it is conceivable, even in such a case, that a catheter drainage might be of value. A rise in blood urea and other toxic signs would suggest its use.

Two procedures are possible: 1. Some form of cæcal exclusion by ileo-colostomy or sigmoidostomy, either as a final operation or as the preliminary stage of a two-stage resection.

This as a final operation has been found sufficient in many cases reported and needs further observation as a valuable conservative measure.

In Brunner's monograph, and later by those reported in the accompanying chart (Shiota, three; Souligeux, two; Wiener, four;), simple exclusion has resulted in permanent cure presumably by encapsulation of the tuberculous process. Cases followed up to seven years after operation by Brunner showed in brief, the following:

Mortality in thirty-six cases (three), 8.3 per cent.; two of tuberculosis and one of perforation peritonitis.

Followed from one to seven years—twenty-three cases: Eight dead in one year from tuberculosis, fistula, volvulus. The remaining fifteen cases (41 per cent.) lived two to seven years, some in perfect health, with the tumor not palpable, others with a tumor still felt but without symptoms. These cases were advanced, poor surgical risks and the results of simple exclusion anastomosis were such as to prompt the remark that this operation can no longer be called simply a palliative one in cæcal tuberculosis, but may justly be considered as a final operation of choice even in some cases where resection is surgically possible. No doubt the after-care against their tuberculosis had

much to do with the outcome, and it is certain that the improved intestinal condition favored nutrition. Tuberculosis differs from malignancy in the absence of the danger of cellular metastasis. Rest of the affected organ is paramount. This is supplied by an ample short-circuiting stoma. Healing of tuberculosis is by scar-tissue encapsulation, and this tendency is already dominant in this type of case. The chief indication is the resulting *obstruction,* and this with its resulting toxæmia and injury to intestinal digestion, is the patient's chief handicap. It will be remembered that the original indication for gastro-enterostomy as conceived by Wöelfler was benign pyloric stenosis. Clinical surgery supplies no better examples of successful therapy than these. Scar-tissue obstruction of the ileo-cæcal valve, although of tuberculous origin, which, however, is being carefully resisted by the individual, is a close second indication for a simple exclusion operation without resection.

II. Since Brunner's monograph, of the sixty-three cases collected from the literature, in eighteen, surgical treatment consisted in a short-circuiting anastomosis, ileo-sigmoidostomy, three; ileo-colostomy, fourteen; cæco-colostomy, one. The operative mortality in this group was 11 per cent.; four months added an additional 11 per cent., and fourteen, or 78 per cent., were reported as recovered or improved. The American as compared with the foreign figures show a lower mortality. It is obvious that an exclusion anastomosis as first practised by early French authors has a place in the treatment of these cases in which the local disease or general condition precludes safe resection. Removal of tissue for biopsy at such operation might not be justified in view of the danger of fistula; so that the final diagnosis may be somewhat in doubt in those cases dying a few months or a year after anastomosis.

Resection of the cæcum, either by one or two stages, seems advisable.

(a) In young adult patients who are good surgical risks.

(b) In patients of cancer age in whom the accurate diagnosis cannot be made.

In a two-stage resection, the removal of a gland or possibly tumor tissue for such diagnosis, would be well and the succeeding treatment be planned according to the findings and the patient's condition. A simple ileo-colostomy in this type of tuberculosis occurring past middle life seems to be the operation of choice. One has little to fear from the secondary occurrence of cancer on such a focus of tuberculous irritation since the coincidence of the two conditions is a great rarity.

Watson did the two-stage operation, first an ileo-colostomy followed seventeen days later by resection. His patient did well. As is preferred by some in the handling of cancer of the large gut, this method offers advantages over the single stage. Difficulty might be experienced in making a lateral ileo-colic anastomosis without interrupting the ileum. In such cases an end-to-side ileo-colostomy could be made, the distal ileum being closed until its later removal. This adds some danger to the first stage, but might be neces-

sary. The advantage would be that the end-to-side ileo-colic anastomosis is much to be preferred to side-to-side.

For resection, a simple clamp operation with the cautery and rigid aseptic precautions should be followed. The incision should be sufficiently ample to give free access to the ascending colon; the colon and ileum should be delivered from the wound if possible, a carefully placed gauze packing beneath them. If the ileum had been sufficiently dilated to approximate the diameter of the colon, an end-to-end anastomosis is preferred by some. Such a procedure has two handicaps. First, after all experiments in the technic of suture, together with clinical results, the end-to-end intestinal anastomoses are more difficult to perform than the side anastomoses, and there is a greater danger of post-operative leak or stricture. Moreover, the ileum, because of the chronicity of the process, as above noted, is often hypertrophied and is not distended, so that an end-to-side anastomosis is much to be preferred. The blind colon end is closed in three layers after cautery sterilization. To prevent the possibility of stricture at the anastomosis, the longitudinal incision through a band of the colon should be ample, and the ileum, cut obliquely, inserted obliquely upward. One-half to three-quarters of an inch of ileum may protrude into the colon. This is done with the author's belief that the oblique position and the protrusion of the ileum into the lumen will act as an ileo-cæcal valve. Three suture layers, gut within and linen on the peritoneal surface and protecting the suture areas with omentum when possible, are necessary.

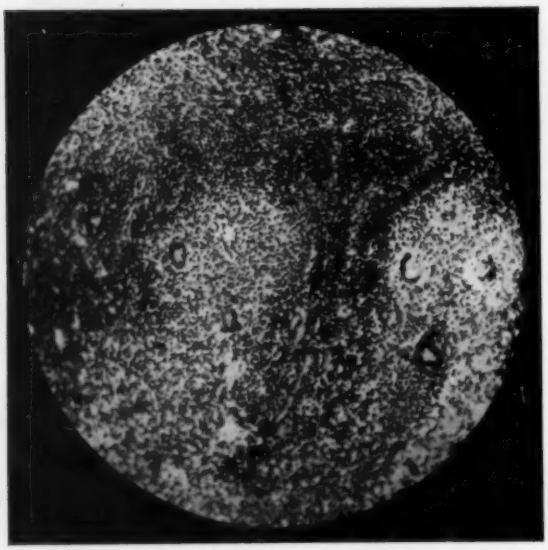

FIG. 4.—Lymph-node.

The patients operated on a wrong diagnosis, *e.g.*, appendicitis, the true nature and extent of the disease was apparent only at operation. In such cases the surgeon's judgment as to the extent of the involvement, the patient's condition, the necessary resection, would determine for a one- or two-stage operation. When caught in a mistaken diagnosis our reliance on operative proficiency and zeal might lead to the choice of a one-stage radical procedure, when a safer conservatism would decide for a two-stage operation and a lower mortality risk. The two-stage removal in cancer of the large gut is well established and proven in most cases to be safest.

In those cases in which the hypertrophic process is found confined to the

appendix, or, as reported by Conrath, occupied a patch on the cæcum, a simple resection sufficiently wide of the disease will suffice.

REPORT OF CASES

Case I.—Author's service, Cleveland City Hospital. Male, age twenty-eight, bookkeeper, married. The patient's mother and wife died of pulmonary tuberculosis, his child of tuberculous meningitis.

Complaint: Stomach trouble and pain in the right lower abdomen.

Past history: For seven years symptoms strongly suggestive of *duodenal ulcer, i.e.*, pain three to four hours after meals, relieved by food or alkalies, no sour food, but "sour gas" eructations, periodicity marked, no vomiting, no melæna.

Four years ago he developed phthisis and went to a sanitorium. Six months ago the attending physician discovered marked tenderness and a mass in the right iliac fossa, and diagnosed appendicitis.

On admission the patient complained of pain in the right fossa and had vomited.

His temperature was 99, pulse 80, white blood corpuscles 11,400: Hg. 85 per cent. Differential count showed. Polymorphonuclears 74 per cent. Small lymphocytes 20 per cent. Large mononuclears 2 per cent. Eosinophiles 4 per cent.

There was moderate right rectal rigidity, a mass was palpable, tender, 2 cm. long smooth, not hard, immovable. His history counselled delay. The acute signs subsided when X-ray showed moderate obstruction at the ileo-cæcal valve.

At operation, through a right rectus incision, the mass was found to comprise the cæcum and appendix with two to three inches of the ileum. The appendix was in the stage of sub-acute appendicitis. The cæcum was mobilized, resected with end-to-side anastomosis, three suture layers, catgut on the two inner and linen on the outer line. A small gauze drain was placed but was found unnecessary. Recovery was uneventful. The patient promptly began to gain and went back to the sanitorium. He gained rapidly in general condition. His pulmonary tuberculosis was arrested. His symptoms of duodenal ulcer returned and persisted until given a month's course of Sippy treatment. He returned to work as a salesman for two years. Was very active. He developed miliary tuberculosis and died two and a half years from date of operation. The abdominal symptoms had never recurred. Autopsy was refused.

One year after the operation gastro-intestinal X-ray by Dr. W. C. Hill showed the following: Fluoroscopic examination showed fairly marked tuberculosis of the upper part of both lungs. The œsophagus appeared normal. The stomach was normal in size and position. No tenderness could be elicited over the stomach nor over the first portion of the duodenum. Neither fluoroscopically nor upon the radiographs could a normal duodenal cap be obtained, there being only a narrow stream passing through the first portion of the duodenum instead of the large duodenal cap normally seen. There was, however, no obstruction since the stomach emptied in somewhat less than the normal length of time. Since there was no tenderness at all in this region upon deep palpation we think there is no active ulcer at the present time.

The barium mixture appeared to pass normally through the small intestine into the colon. There appeared to be adhesions at two different points in the transverse colon, but there was no constriction, the barium meal passing through normally. Examination showed that the cæcum had been removed.

It is possible that this patient had the same tuberculous process in the duodenum without obstruction.

Microscopical Examination—Dr. Guthrie McConnell.—Section of cæcum measures 1 cm. and includes the entire thickness of the wall at this particular point. Elsewhere the thickness reaches some 2 cm. The mucosa is well preserved and contains a great

number of lymphocytes and many eosinophiles. The submucous zone is much thickened and contains an unusual number of capillaries, all of which are greatly engorged. Blood cells are found also lying free within the tissues. Lymphocytes are present in great numbers and there is an intense leucocytic infiltration. Numerous young connective-tissue cells are also found.

Close to the edge of the muscular zone are several round or oval areas in which the cells are not closely packed nor deeply stained. Enclosing these to a great extent, are broad zones of deeply stained lymphoid cells. In these areas the cells contain irregularly oval nuclei that do not stain deeply and which are surrounded by a large amount of cytoplasm. A few capillaries are present. No definite areas of necrosis are seen but in one or two instances there is a sharply delimited mass of leucocytes and red blood cells. Many large multinucleated cells are noted in which the irregularly oval, poorly staining nuclei are arranged radially around a central field of clear, homogeneous protoplasm. In a few instances these minute tubercles are found just within the inner portion of the muscular layer. Within the muscularis are a few well defined areas in which the muscle has been destroyed and replaced by the formation of a very dense connective tissue mass. Beneath the serosa are found many sharply defined oval areas similar to those seen within the submucosa. The muscular coat is much infiltrated by lymphocytes and some leucocytes.

Section of lymph-node: Scattered through the tissue are many sharply circumscribed areas composed mainly of young proliferating connective tissue cells arranged largely in circular layers. Many very typical Langhan's giant cells are present. No necrosis seen.

In the lesions of the cæcum and the lymph-node, it is interesting to note that the tubercules have not undergone necrosis but that there is marked tendency to form fibrous tissue.

Histological Examination.—Section of intestine shows a wall greatly thickened on account of the many areas of epitheloid cells, surrounded by lymphocytes. Many giant cells present. Mucosa not much damaged. Lymph-node shows many sharply circumscribed areas of necrosis. Giant-cell formations and epitheliod proliferation. No change noted in the walls of the blood-vessels. Tuberculosis of intestine and lymph-nodes, ileo-cæcal valve very small, markedly thickened ring. *Pathological Diagnosis: Tuberculoma of ileo-cæcum.*

Case II.—Reported through the courtesy of Dr. C. A. Hamman, Charity Hospital, C.978. Female, fifty-eight years, married, two children living and well. No cancer nor tuberculosis in the family history. About ten days ago, when patient awoke, she noticed a soreness in the lower right abdomen. The soreness and tenderness grew progressively more severe and were not accompanied by attacks of pain at the time. No. nausea. No vomiting. No fever. Yesterday patient had a sharp cutting pain, intermittent in character in the region of the soreness. Could not straighten out right leg on account of pain so was confined to bed for the first time. Appetite good until yesterday. Bowels usually constipated, takes pills nightly. No more marked than usual. Pain localized in right iliac region and does not radiate to back or rectum. No pain to-day, but soreness. Pain if she attempts to move about. No other symptoms, No loss of weight. Operation fifteen years ago for a double ovariotomy.

Influenza about two years ago, La Grippe one year ago. Nervous breakdown two months ago. Neuritis and weakness in both arms ever since. Better now. Dizziness past two years of aggravated character. Could not lie on back without getting very dizzy.

A thin, somewhat feeble elderly female. Pupils equal and react to light and accommodation. Teeth in fair condition. Tongue clean. Neck thin with readily palpable submaxillary glands. Fair expansion of chest. Prominent fossæ. Breath sound clear No râles. Heart sounds clear and strong. No murmurs. Heart normal in size and position. No distention of abdomen. Liver and spleen not enlarged or palpable. Acute

tenderness over McBurney's point which prevented deep palpation, but a small mass could be felt in the right iliac fossa. Pressure in upper abdomen or on left side produces pain in McBurney's area.

Operation.—Right rectus incision. The appendix is non-inflamed. There is a tumor, three-quarters of an inch to one inch in length, originating in the ileum, perhaps one inch from the ileo-cæcal valve. There is a rather extensive glandular involvement of the mesentery. The lower four or five inches of the ileum, entire cæcum and most of the ascending colon were resected. Lateral anastomosis. No other masses were felt. Stomach normal. Gall-bladder normal. A normal recovery followed.

Microscopical Description.—The section shows very little recognizable mucosa, entire section consisting of diffuse fibrous tissue, intense lymphocytic infiltration and very numerous giant cells and tubercles. *Pathological Diagnosis.*—Hyperplastic tuberculosis of the cæcum.

Case III.—Reported through the courtesy of Dr. C. A. Hamman, Charity Hospital. B.627. Male, twenty years of age. Single. No tuberculosis in the family history. Patient was just recovering from an attack of influenza when he began having pain in the right iliac fossa. Five days after trouble began under a diagnosis of appendicitis he was sent to hospital.

General health always good. Had whooping cough when a child. Pneumonia at fourteen years. When admitted he had a temperature of 100°F., with a visible mass in the right iliac fossa.

Operation.—Revealed the mass to be composed of omentum considerably thickened and firmly adherent to the abdominal wall, beneath which was a small amount of pus without fecal odor and with much necrotic material. Cæcum and appendix were not recognized. Suspicion of actinomycosis. Section from the abscess wall was removed for examination. *Pathological Diagnosis.*—Tuberculoma of cæcum and appendix.

December 3, 1924. The patient is in excellent health, weighing two hundred and five pounds, a gain of thirty-five pounds since operation.

From literature (see bibliography) it has been possible to gather the details of sixty-three cases reported since 1907. An analysis of these cases gives the following facts:

Age Incidence:

1 to 10 years	2	13	50 to 60 years	1	1
10 to 20 years	11		60 to 70 years	0	
20 to 30 years	23	14	70 to 80 years	0	
30 to 40 years	18		80 to 90 years	1	1
40 to 50 years	7	7	?	3	3

Onset: Initial symptoms.—Pain present in every case, varying from dull ache to colic.

Onset sudden	24
Onset gradual	21

Duration of Symptoms:

2 months and less	15	27
2 months to 6 months	11	
6 months to 1 year	9	16
1 year to 2 years	7	
2 years to 4 years	4	7
4 years to 6 years	3	
6 years to 8 years	5	6
8 years to 10 years	1	
Several years	2	2

Complaint During This Time:

Pain	38	Const. and diarrhœa alt.	8
Colic	15	Tarry stool	1
Obstipation	1	Peritonitis	1
Diarrhœa	8	Night sweats	3
Fever	10	Const.pation	14
Anorexia	1	Nausea and vomiting	1
Weakness	5	Intest. obs. and fecal vom.	1
Loss of wt.	20	Tumor	7
Vomiting	20		
Blood in st.	5		

Acute Ileus:

With preceding symptoms	9
No preceding symptoms	1

Tumors Palpable 25

Tuberculosis Elsewhere:

No	35
Yes	29
Lungs	13
Peritoneum	1
Omentum	1
Suprarenals	1
Renal tuberculosis	1
Small intestines	1
Peri aortic glands	1
Questionable	5
Cervical adenitis	3
Peritonitis at operation	3

Treatment:

		Result	Recovered	Died	Improved
Simple laparotomy	9		5	4	
Anastomosis only, without resection.					
Ileum to cæcum	1			1	
Ileum to ascending colon	6		3	2	1
Ileum to trans. colon	9		4	2	3
Ileum to sigmoid	2		2		
	18				
Resection:					
Resected	13		12	1	
Ileum to cæcum	4		4		
Ileum to ascending colon	15		8	1	6
Ileum to trans. colon	3		2	1	
Ileum to sigmoid	3		1	1	1
	38				

SUMMARY

1. There occasionally occurs in tuberculous patients a tuberculous process localized chiefly in the cæcum or colon and characterized by a predominance of scar tissue and round-cell infiltration to a degree closely simulating new growth.

2. This process has been called hyperplastic tuberculosis, but recently authors agree on the term of tuberculoma as more descriptive.

3. It is apparently noted more commonly in the pathological than the surgical departments.

4. By causing chronic incomplete ileus this condition may produce a major handicap in the recovery from pulmonary tuberculosis.

5. The chief errors, both in pre-operative and operative diagnosis are, calling it appendicitis in young adults or cancer in middle or later life.

6. Incomplete or complete ileus may furnish the first definite symptoms.

7. In several classical cases and some reported more recently, histological differentiation was difficult or impossible.

8. Treatment: (a) In young adults simple exploratory operation or an exclusion anastomosis has been followed by excellent results. (b) Resection is preferable in good surgical risks. (c) In an old patient where differentiation from cancer can be made an exclusion anastomosis is preferable.

The author is indebted to Dr. C. A. Hamman, of Cleveland, for the privilege of including two cases in this report and for bibliographic assistance; also to Dr. H. T. Karsner, of Cleveland, for the assistance of his Department of Pathology at Cleveland City Hospital and for suggestions in bibliography.

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OVARIAN DERMOIDS*

A STUDY OF ONE HUNDRED CONSECUTIVE CASES

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The general conception of ovarian dermoids is based on numerous reports of single cases, or on short series of cases. The morphology of these tumors is macroscopically and histologically well established. Complications, such as torsion, infection, and malignant change, are common. The relative frequency of the various symptoms and signs, and the different anatomic forms and their complications, have not been definitely noted, and the wealth of material at the Mayo Clinic suggested the study of a larger series of cases to determine such findings. The histories of 100 consecutive patients with ovarian dermoids treated in the Mayo Clinic between January 1, 1919, and July 1, 1923, were studied. In the 100 patients, 128 dermoids were found, but only one from each patient was used for pathologic study. Each tumor was examined grossly; it was then dissected, and from one to eight blocks selected for examination microscopically.

The average age of the patients was 38.37 years. The youngest was eighteen, the oldest seventy-one. The incidence, according to decades, is shown in Table I. Occasional reports, as those of Cattermole, Jalland, and others, show that ovarian dermoids are not infrequently removed from children.

Table I

Incidence According to Decades

Age, years	Cases
0 to 9	0
10 to 19	1
20 to 29	22
30 to 39	37
40 to 49	27
50 to 59	5
60 to 69	7
70 to 79	1

The presence of the ovarian dermoid is not markedly inimical to conception and child-bearing. In this series twenty women had never been married. Sixty (75 per cent.) of the eighty married patients had borne a total of 184 children, or an average of three and six-hundredths each; seventeen had also had miscarriages; three had had miscarriages only, leaving seventeen of the married who had never been pregnant. Of these, three had been married

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two years or less, nine had large uterine fibromyomas, while in five the dermoid cyst was the only gross pathologic condition and may have been a cause of the sterility.

De Lee asserts that ovarian cysts, unless located in the pelvis, exert no influence on labor, and that tumors, especially dermoids, which become adherent to the rectum, are likely to be infected with colon bacilli. Bonney describes a case in which an ovarian dermoid was expelled through the rectum during labor, and refers to six similar cases in the literature, also to five in which the tumor was driven through the vagina. In the present series abnormal labors were infrequent. One patient required Cesarean section because of obstruction of the pelvic outlet by the dermoid. Instrumental delivery was required in only eight cases. Symptoms of infection appeared immediately after labor in one patient in whom at subsequent operation bilateral infected dermoids were found.

Graves believes that the symptoms of ovarian tumor are due chiefly to pressure on surrounding organs, or to complications. Dermoids are not an exception. Forty-two patients came to the Clinic with no complaint, or with complaints referable to other diseases; the presence of the dermoid was not suspected, and so far as could be determined, it was producing no symptoms. Six had large uterine fibromyomas. In these the dermoid was small and all the symptoms could well be explained by the uterine tumors. Fifty-eight patients had symptoms evidently due to the ovarian dermoid. In most of these the tumor was larger than the average.

Eighty-four of the histories contained data concerning the menses. Ten patients had passed the menopause, forty-six had normal periods, and twenty-eight had some menstrual disorder. Dysmenorrhœa was present in ten, leucorrhœa in two, and metrorrhagia in sixteen. Large uterine fibromyomas accounted for the excess flow in six; in fifteen the menstrual disorders were associated with other complaints; in the other seven the menstrual disturbances were the only indications of the growth. Among these there were three instances of metrorrhagia, three of menorrhagia, and one of leucorrhœa. In the last instance there was a brown discharge which appeared twenty years after the menopause in a woman aged sixty-eight.

Twenty-seven of the fifty-eight patients who had symptoms apparently due to the dermoid complained of pain or a bearing-down sensation. The pain was described as a dull ache in one or both iliac fossæ, or extending across the lower abdomen. In the majority it was constant; in some it was present at irregular intervals. A few complained of a burning or shooting sensation throughout the entire pelvis. In this group of patients, four also had menorrhagia, five dysmenorrhœa, eight bladder distress such as frequency, burning on micturition, or a pressure sensation, three backache, and one pressure sensation in the rectum. Six patients had no other symptoms except pain. At operation infected dermoids were found in three patients of this group.

Seventeen patients came to the Clinic because of a tumor which they could

feel in the lower abdomen. One patient could manipulate the tumor into the upper abdomen. One patient was aware of the tumor for a period of twenty years, another for four years, and two patients for periods of three years each. Associated with the tumor were: backache in three, pelvic pain in three, urinary bladder distress in two, rectal distress in one, and dysmenorrhœa in five. The presence of the tumor was the only complaint in three.

Attacks of acute pelvic pain were the only symptoms in five cases. Vomiting, fever, tenderness in the lower abdomen, and irritability of the bladder, were at times, in different cases associated with these crises. They simulated somewhat the colic of ureteral stones, although the pain in two cases was referred to the outside of the thigh. At operation a twisted pedicle, or evidence of this accident, was found in all.

A fistula from the vagina to the dermoid was present in two cases. One manifested itself a few days after labor and was followed by symptoms of pelvic infection; it had been discharging for four years. The other was produced by vaginal puncture of a mass mistaken for a pelvic abscess. In one, hair protruded into the vagina. Kelly says that suppurating dermoid cysts often break into the bladder. Gardner reported the history of a patient in whom the dermoid communicated with the rectum.

Sicard and Gosset, in 1913, reported a case of the X-ray shadow of a dermoid tooth being mistaken for a ureteral calculus. Edeiken and Sutherland recently cited cases in which röntgenograms of the pelvis revealed dermoid shadows. In this series ten patients were subjected to a röntgenologic examination of the pelvis as a part of the investigation to rule out ureteral calculi. Although ray-opaque bodies were subsequently found in the dermoids of eight, only five had pelvic shadows. A cystoscopic examination was required in two cases to determine the extra-ureteral location of these shadows. Campbell believes that bilateral dermoids are rare and that according to statistics they are found in only one per cent. of cases. Weiner found one bilateral case in sixty, and Kelly only one in eighty-seven. Of the 100 cases of this series, unilateral ovarian dermoids were found in eighty-seven, and bilateral in thirteen. The average age of the patients with bilateral dermoids was 35.85 years. Ten were married, and three were single. Child-bearing was slightly reduced. Of the ten married women seven had borne a total of seventeen children, or 2.4 each. The other three have never been pregnant, although married six, four, and seven years, respectively. Forty-eight of the eighty-seven unilateral dermoids originated from the left ovary, and thirty-nine from the right ovary. This difference bears no explanation, and possibly no significance.

Kelly reported one tumor with a twisted pedicle in his series of eighty-seven cases. Sanes found two dermoids among nine ovarian tumors with twisted pedicles. Weiner reported ten dermoids in a series of thirty-three cases of ovarian tumors with twisted pedicles. Ivens and Le Moniet reported cases wherein the dermoid had become parasitic after complete torsion. In the present series three tumors had twisted pedicles, and two were completely

twisted off. One had implanted itself on the posterior wall of the uterus, and the other on the greater omentum; this tumor could be manipulated into the upper abdomen. In the three cases the torsion was chronic. Although one or two complete twists were present in all, complete loss of circulation had not resulted. The average age of the five patients of this group was 38.6 years. These women had all passed through repeated pregnancies. The average number of children borne by each was six. Weiner found among six infected ovarian cysts, two dermoids. Practically all types of pathogenic organisms have been isolated from infected dermoids. O'Shansky found typhoid bacilli in one, six months after the attack of typhoid fever. In the present series infection had occurred in three. In one the tumors were bilateral, and both were infected. One of the other two was associated with a tubo-ovarian abscess on the same side, and the other was apparently induced by a twist of the pedicle.

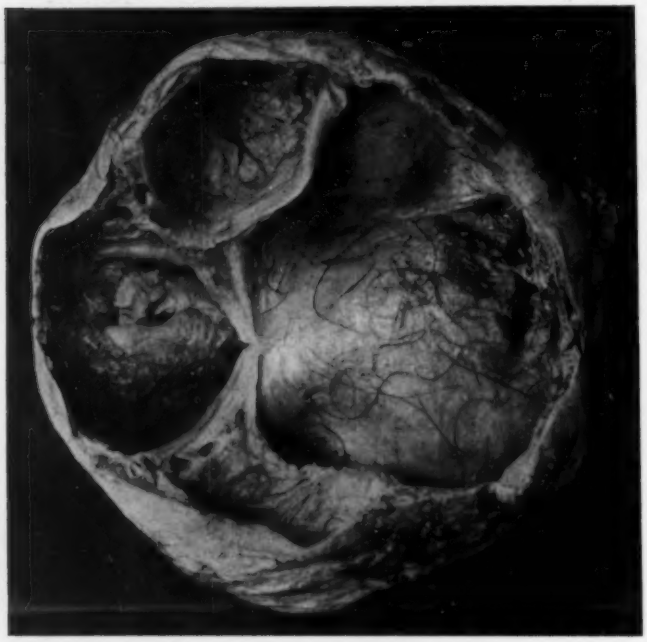

FIG. 1.—Three dermoid cysts in one ovary.

Large numbers of dermoids in one or both ovaries have occasionally been reported. Novak found twenty-one dermoids in one patient, eleven in one ovary, and ten in the other. Two or three dermoid growths in one ovary are not unusual. In Kelly's series one ovary contained two dermoids. Multiplicity of dermoids was found in seven cases of the present series. In a case of bilateral tumor one ovary contained four separate dermoid cysts, and the other five. In another case three dermoids (Fig. 1) were present in one ovary, and in five cases two were present in one ovary.

In most treatises on ovarian tumors it is asserted that dermoids are comparatively small growths, rarely attaining 14 cm. In this series the size was expressed in terms of weight in forty-six cases. The average of these was 532.76 gm. The largest tumor weighed 4.4 kg. Exceptionally large ovarian dermoids have been occasionally reported. Humistan cited one recently which weighed 12.3 kg., and referred, in the literature, to three others, weighing 50 kg., 45 kg., and 18 kg., respectively.

Other types of ovarian cysts were associated with the dermoids in seventeen patients. In one case, bilateral simple cysts were present; in four cases simple cysts were present in the same ovary; and in eight cases simple cysts were present in the other ovary. Associated bilateral chocolate cysts were present in one case. A multilocular cystadenoma was in the same ovary as the dermoid in three instances (Fig. 2). The latter association, reported by Arnsperger to occur in 14 per cent. of cases, and by others to occur much less often, has led certain observers to believe that these growths are a one-sided ectodermal development of the dermoid.

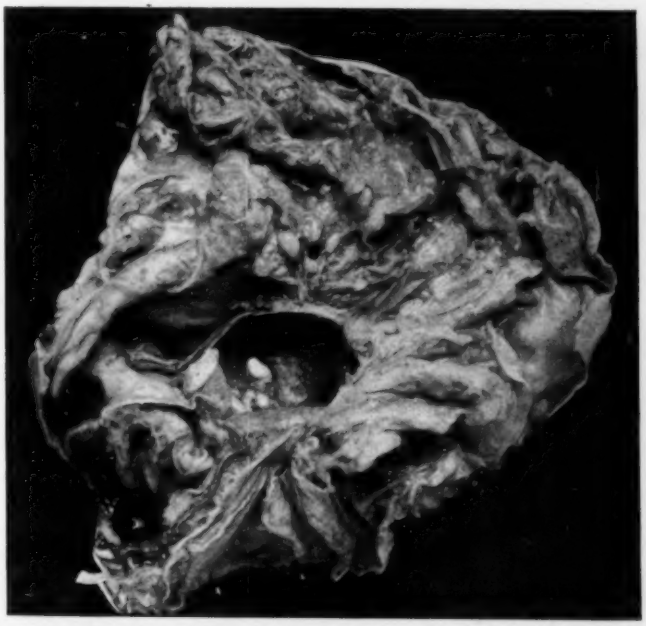

FIG. 2.—Multilocular cystadenoma which contained a small dermoid.

Instances of many types of malignant degeneration of ovarian dermoids have been reported. In 1911, Williamson and Barris noted in the literature thirty-two cases of squamous cancer, but of these, fourteen were rejected because of incomplete data. Weiner, in sixty cases of dermoids, found three with squamous-cell cancer. In this series one case of malignant degeneration was present. This was a squamous-cell cancer in a woman, aged forty-eight (Fig. 4). The cancer had perforated the dermoid and affected the ileum. Its removal required resection of about 30 cm. of the intestine.

The contents of an ovarian dermoid is its most characteristic feature. The yellowish, turbid, oily material containing matted or even felted hair cannot be confused with the contents of any other cyst. When cooled they acquire a semisolid, greasy, sticky consistency not unlike vernix caseosa and not uncommonly containing loose teeth and pieces of bone.

Rarely the fat is found in spheres. This curious phenomenon of globule formation has been attributed by some observers to the churning action of the dermoid, by others to the admixture of bloody exudate, since it occurs chiefly in tumors with a twisted pedicle. One such in this series contained 847 sebaceous spheres, remarkably uniform in size and color. Each was approximately 1 cm. in diameter and snowy white. McMeans, who recently described a case in which the globules were innumerable, showed that they

dissolve in ether, leaving a small amount of residue which microscopically shows degenerated epithelial cells and granular débris. Bonney reported a case which contained nearly 4000 globules.

The typical ovarian dermoid, cleansed of its fat and loose hair, reveals a projection into its cavity. This, known as the plug, pseudomamma, or focus, is covered with hairy skin, and contains the parenchyma of the tumor. The rest of the cyst wall is smooth and glistening, with irregular areas which are reddish in color and wrinkled. Teeth are rarely noted projecting from this part of the wall. Ordinarily it is 1 to 2 mm. thick. In five instances the thickness was markedly increased. Figure 3 shows one in which the wall in places was 2 cm. thick. Calcification of the wall was present in eight cysts. The wall was sacculated in fifteen. In some cases this originated through communication with simple ovarian cysts, but in the majority it appeared to be due to herniation through a weakened point under the increasing tension within the cyst. Near the plug or focus, the skin extended over the cyst wall for a varying distance. It grew thinner away from the focus and finally ended. Beyond this the wall consisted of dense fibrous tissue, devoid of a lining, or with a lining of granulation tissue containing embedded hair and giant cells.

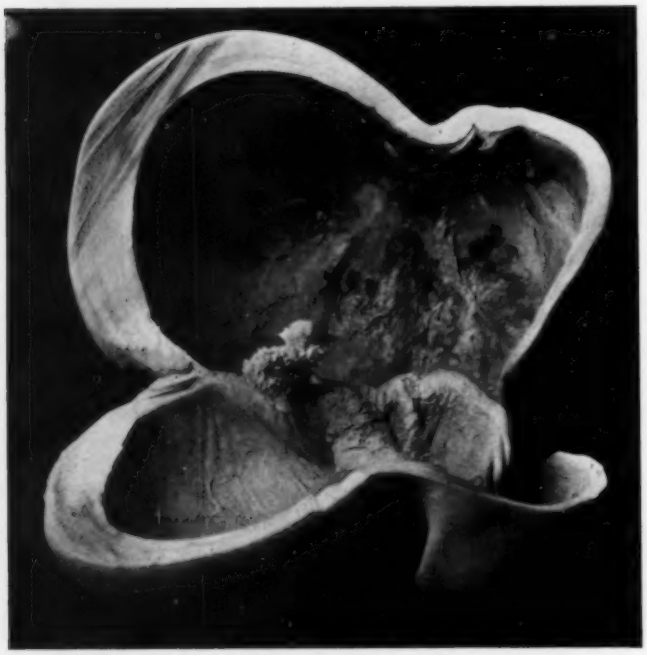

FIG. 3.—Cyst wall, thickness of which is markedly increased.

The plug or focus is the essential part of a dermoid. Its growth and secretory activity determine the size of the tumor. Its gross anatomy varies from a flat cutaneous area to a structure resembling an acardiac fœtus. Shattock, in his Erasmus Wilson lecture, demonstrated a series of specimens, beginning with an incomplete dermoid fœtus, illustrating the progressive loss of limbs and abdominal structures. Such specimens, although the subject of numerous reports, are relatively rare.

In forty-one of the dermoids that were examined in this series, the interior was smooth, or revealed only a slight thickening of the lining to mark the site of the focus. A few of the smaller cysts were lined entirely with skin. The

entire lining of seven grossly resembled granulation tissue, although loose hair and sebaceous material were present in the contents, and microscopic examination showed stratified epithelium. In twenty-four tumors the focus was an elevated area or a nodule, usually sessile, sometimes pedunculated. In some the nodule was an irregular knob; in others it was a long finger-like process. These structures sometimes showed a superficial resemblance to normal organs. The finger-like process was sometimes attached at both ends, forming an arch across the cyst cavity (Fig. 4), as seen in thirty-two of the dermoids. One base was usually larger and contained the teeth, bone, and other tissues characteristic of these tumors, but they were sometimes located in the body of the arch which was then an irregular, elongated mass attached by thin, fibrous pedicles at each end (Fig. 5).

FIG. 4.—Bridge type of focus.

In three dermoids a thin web structure extended across the cyst cavity, partially dividing it into two unequal compartments. It consisted of fibrous tissue, and was irregularly covered with skin. One specimen had a complex gross structure. The greater part of it was solid. It had several irregular communicating cyst cavities and an intricate bony framework covered with skin and other soft tissues.

Teeth are a frequent finding in ovarian dermoids. In Saxer's case a single, well-formed tooth was present in an ovary; no other structures of an ovarian dermoid were found. Sutton states that 200 teeth have been counted in a multilocular dermoid. Hopewell-Smith has shown that their structure is not unlike that of normal teeth. Potherat observed caries of an ovarian dermoid tooth. Thirty-nine of the cysts in this series contained teeth. The number varied from one to twenty-eight, two or three usually being present. In most cases the teeth were buried under the skin and fibrous tissue of the focus. In one case the teeth were scattered over the cyst wall. When bone was present the teeth were usually embedded in it. In this series bone was present in thirty-three cysts. In only two cases did the bony mass superficially resemble a normal bone, a jawbone in both cases.

Dissection of the focus may reveal other tissues and structures which

may be recognized macroscopically. In the 100 tumors examined, the focus of twenty-eight contained cysts varying from a few millimetres to several centimetres in diameter. These cysts were superficial, and visible through the thinned-out overlying skin, or deeply buried. Their contents were mucoid, serous, or gummy. In two cases coils with a wrinkled, velvety lining were recognized. The lumen of these coils communicatd in one instance with the main dermoid cyst cavity. The lining in both was of an intestinal type. Brain tissue was recognized microscopically in three cysts. Accumulations of fat tissue, several centimetres thick and approaching the character of a lipoma, were present in five cases.

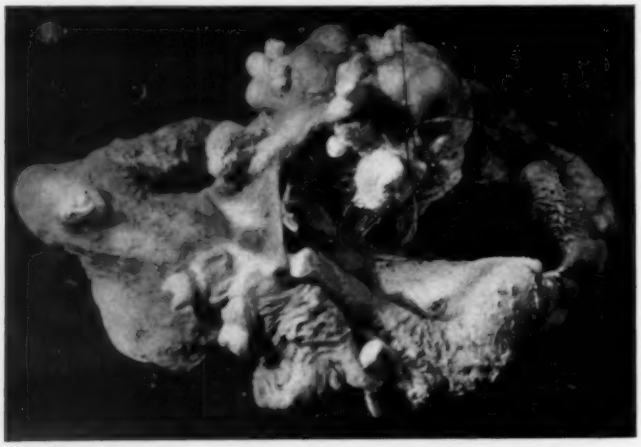

FIG. 5.—Bridge type of focus with teeth projecting from the wall of the cyst. Imperfect jaw bone.

Microscopically, squamous epithelium was found in all cases. The typical dermoid squamous epithelium resembled that found in the mouth. In infected dermoids and in those found in old patients, the epithelium was often shed, or only two or three cells thick. Cornification was usually slight or absent, but in a few instances there was a horny layer 1 mm. or more in thickness. The surface epithelium in depressions on the focus or on the under surface of the bridging type of focus frequently consisted of stratified columnar cells. There was a definite line of transition from the squamous to the stratified columnar type.

Hair was present in all but one case. Typically the hair was from 10 to 15 cm. long, reddish-brown, and loose, tangled, or even felted. Much of it was frequently implanted at both ends, that is, growing from one end and into the opposite wall at the other. This long hair was usually limited to one or two patches on the focus. Lanugo hair was present over the rest of the focus and the surrounding area of skin. The under surface of the bridging type of focus was usually devoid of hair.

Sweat-glands were present in eighty cases. They closely resembled normal skin sweat-glands. Dilatation of these glands was noted in one case. The ducts were straight and few in number. Sebaceous material was present in ninety-nine of the dermoids; sebaceous glands were presumably present at the same time, but they were found microscopically in only ninety-four. They were morphologically similar to normal sebaceous glands. They opened on squamous epithelium only. Dilatation of these glands resulting in sebaceous cysts was not infrequent. Salivary glands, also of ectodermal origin, were

found in twenty-one specimens. Their demilunes and serous elements permitted differentiation from other glands. Tissue of the submaxillary type was more abundant and more common than the pure serous type found in the parotid.

Nerve tissue was demonstrable in sixty-one cases. Large nerve trunks were present in forty-nine, nests of ganglion cells in twenty-four, brain substance in twenty, neuralgia in thirty-two, and ependyma in four. The nerves were all non-medullated. The ganglion cells were found in nests frequently near the muscle walls of entodermal structures. The brain showed marked morphologic variations. Excess of neuralgia and a paucity of brain cells characterized the usual type of dermoid brain. Sharply defined, calcified areas were found in several cases. These might be interpreted as brain sand. Neuralgia was widely distributed. Its demarcation from the surrounding fibrous tissue was usually indefinite. Its cells were irregularly distributed, and their tendrils few and short. Groups of tapering columnar cells which were arranged in a single layer around an indefinite lumen and surrounded by nerve tissue were interpreted as ependyma.

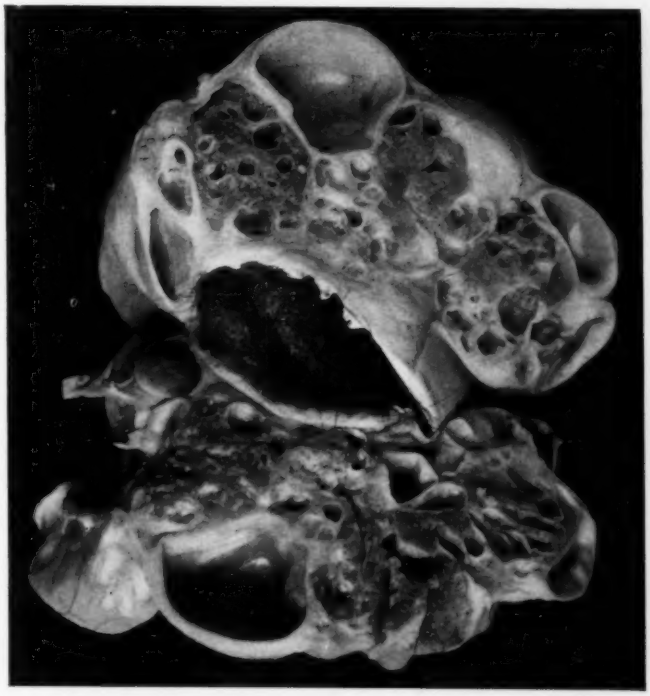

FIG. 6.—Dermoid, greater part of which consists of thyroid tissue.

Tissues derived from the mesoderm were present in ninety-four cases. In the other six the lining epithelium and its derivatives were separated from the ovarian substance by only a thin layer of areolar tissue. This and the fibrous wall of the cyst may have originated either from the stroma of the ovary or from the dermoid itself. The mesoderm was represented by fat and areolar tissue, muscle, bone, cartilage and certain parts of the teeth, as the dentine. The muscle found was all nonstriated. It was present in sixty-two cysts. Cartilage, all of the hyaline type, was found in forty-five. It frequently formed segments of rings around hollow structures with a lining similar to that of the trachea. The different structures found in the focus

were held together by fibrous and loose areolar tissue, frequently containing fat.

Derivatives of the entoderm were demonstrable in fifty-seven dermoids. In eight specimens an intestinal type of mucosa was found. This consisted of a single layer of columnar cells with definite crypts. In two, glands not unlike Bruner's glands, were present. These gastro-intestinal structures had a thick, smooth muscle wall indefinitely arranged in two layers. Segments of the trachea, or one of its divisions, were present in twenty. These were lined with two-layer columnar epithelium, had a definite muscle wall, and were frequently surrounded by segments of rings of cartilage. Mucous glands were present in abundance. In twelve specimens there were present epithelial-lined structures with thick, smooth muscle walls, which, though classified as of entodermal origin, may have been derived from the ectoderm. Seven of these had a stratified columnar epithelial lining not unlike the stratified surface epithelium of the focus of the dermoids. In a few the epithelium changed abruptly from a stratified columnar type to the gastro-intestinal type. In five the lining was a low cuboidal epithelium. These structures may have been gland ducts originally lined with columnar epithelium which had become modified through increased pressure. Tissue histologically resembling thyroid tissue was present in nineteen cases. In five it was present in microscopic amounts only. In fourteen its brownish-red colloid in cysts, from a millimetre to several centimetres in diameter, permitted recognition macroscopically. In many cases it formed the greater part of the tumor (Fig. 6).

CONCLUSIONS

1. Patients with ovarian dermoids usually come to the surgeon during the fourth and fifth decades of life.

2. Unilateral dermoids do not markedly interfere with child-bearing; if the dermoids are bilateral, this function is definitely reduced.

3. The symptoms of ovarian dermoid are due chiefly to pressure on surrounding organs, and to complications. The menstrual flow, in spite of the marked distortion and destruction of the ovaries, is increased rather than diminished.

4. Röntgenologic examination, made in a small number of cases, revealed pelvic shadows in half of them.

5. Bilateral dermoids were found in 13 per cent. of cases, twisted pedicles in 5 per cent., infection in 3 per cent., malignant change in 1 per cent., and associated ovarian cystadenoma in 3 per cent.

6. The average weight of forty-six tumors was 532.76 gm.

7. The sac of the cysts was markedly thickened in 5 per cent. of cases, partially calcified in 8 per cent., and sacculated in 15 per cent.

8. The focus was flat or grossly unrecognized in 41 per cent. of cases, a nodule in 24 per cent., a bridge in 32 per cent., a web in 3 per cent., and complex in 1 per cent.

9. Derivatives of the ectoderm were found in all specimens, of the ectoderm in 94 per cent., and of the entoderm in 57 per cent. Thyroid tissue in amounts which permitted recognition macroscopically was present in 14 per cent.

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THE SUTURE OF THE APONEUROSIS OF THE INTERNAL OBLIQUE MUSCLE TO THE LIGAMENT OF POUPART FOR THE CURE OF INGUINAL HERNIA

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of New York, N.Y.

The experiments of Doctors Gallie and LeMesurier,* of Toronto (Transactions American Surgical Association, 1923, p. 331) apparently demonstrate that the failure of operations for inguinal hernia may be due to the attempt to unite tissues of unlike histology in the operative methods usually employed for it is rarely possible to accomplish a firm union between tissues of different structure. When muscle is approximated to fascia the tissues unite by interposition of a layer of loose connective tissue, a union much less firm than occurs when aponeurosis denuded of all connective tissue is approximated firmly to another piece of aponeurosis similarly treated, the firmer union of the latter being due to the fact that tissues of similar histology readily blend one with the other, so that after the inflammatory reaction due to trauma of the tissue edges has receded it is difficult to tell where the union was accomplished.

In the various forms of operation usually practiced for the repair of inguinal hernia in none is the inguinal canal closed by uniting to each other tissues of like histology. In all these methods the inguinal canal is closed by sewing to Poupart's ligament either the conjoined tendon (so-called), the fibres of the internal oblique muscle or the fibres of the rectus.

In considering the anatomical structures available for use in attempts to close the inguinal canal in hernia, Poupart's ligament is the one aponeurotic structure which presents the required firm white fibrous tissue in its structure in contact with which similar tissue from the other side of the inguinal canal must be obtained if the closure is to be of satisfactory strength. The so-called conjoined tendon is tendinous only at the site of its insertion into the pubic bone. Above this point it is practically entirely composed of muscle fibres. The extent of the fibrous elements of the aponeurosis of the internal oblique muscle is far more satisfactory. The internal oblique changes from muscle to aponeurosis just lateral to the linea semilunaris and passes to the linea alba as a part of the anterior sheath of the rectus muscle below the semilunar fold of Douglas. When the inguinal canal is opened by splitting the aponeurosis of the external oblique and the inner leaf of the aponeurosis of the external oblique is retracted medially, the internal oblique muscle is exposed, and by the time the linea semilunaris is reached the structure of this internal oblique has become aponeurotic. It is practicable by making a suitable incision in this aponeurosis parallel to and medial to the linea semilunaris for the distance equivalent to the length of the inguinal canal, to turn the aponeurotic leaflet thus obtained outward and downward and then to secure

* Canadian Medical Association Journal, July, 1923.

its cut edge to Poupart's ligament, thus making a purely aponeurosis to aponeurosis apposition.

The steps of such an operation are as follows:

An incision is made through the skin down to the aponeurosis of the external oblique, exposing the roof of the inguinal canal from the external to the internal ring. Incise the aponeurosis of the external oblique, cutting the intercolumnar fibres from the external ring up as far as is necessary to expose the internal ring. This gives us two aponeurotic leaves, which we have called, respectively, the medial and lateral leaf of the external oblique. These aponeurotic edges are grasped with forceps for the purpose of identification. The contents of the canal are now delivered, the sac isolated and opened, and the hernia reduced. By pulling downward on the sac in the canal as much as possible of the peritoneum around the ring is drawn out. Around this funnel-shaped peritoneum a purse-string suture is placed. The sac is cut away external to the purse-string suture, the ends of which are left long, to be threaded on a blunt curved needle, which is introduced under the internal and external oblique and brought up through them about one inch or more further cephalic and medial than the internal ring, and tied upon the surface of the external oblique so as to draw the peritoneum which occupied the site of the internal ring up away from it.

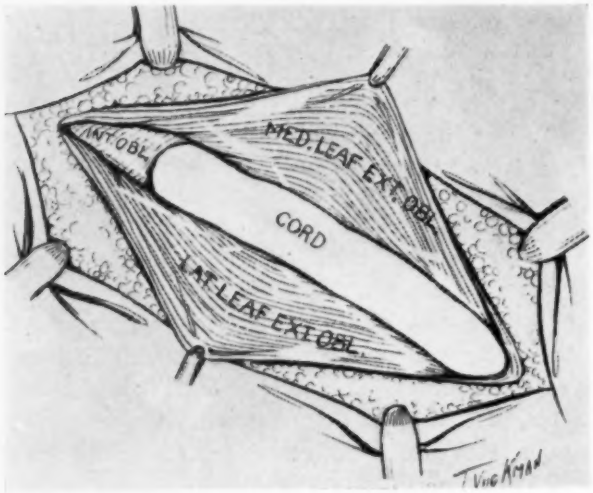

FIG. 1.—Inguinal canal opened developing the two leaves of the external oblique, median and lateral. Cord is exposed.

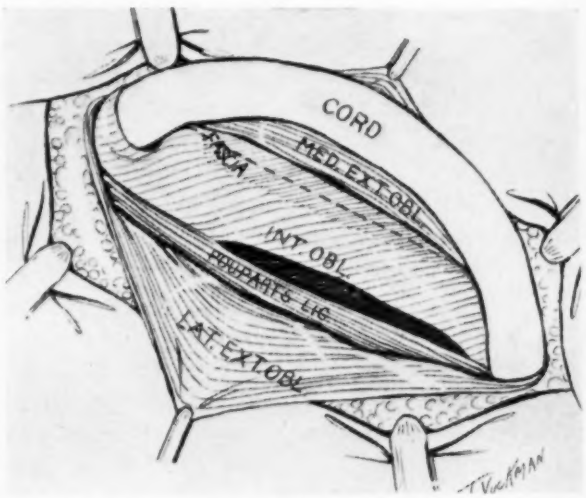

FIG. 2.—The hernia reduced and sac dealt with. The cord retracted to expose the internal oblique muscle as it becomes aponeurotic just lateral to the linea semilunaris. The dotted line indicates the incision in the aponeurosis of the internal oblique.

The remaining components of the cord are retracted from the canal laterally, so as to expose the internal oblique muscle as it sweeps medially from the inguinal region to become a portion of the anterior sheath of the rectus. The medial leaf of the external oblique is retracted medially and by careful blunt dissection the aponeurosis of the internal oblique is exposed as far medially as is necessary to demonstrate its change to aponeurotic tissue. An incision is made in the aponeurosis of the internal oblique parallel to Poupart's ligament over a sufficient length to allow a flap of the internal oblique to be turned over and sutured along the shelving border of Poupart's ligament from the external ring up along the canal and around the internal ring. This incision usually extends from the level of the upper border of the internal ring downward for about two and one-half inches. This develops two more aponeurotic leaves, the lateral leaf of the internal oblique and the medial of the internal oblique. The lateral leaf of the internal oblique is dissected free of the rectus muscle, and here it may be noted that this lateral leaf of the internal oblique occasionally includes demonstrable fibres of the aponeurosis of transversalis muscle. As the lateral leaf of internal oblique is turned outward, it is easy to demonstrate the fact that it is a purely aponeurotic leaf and to wipe it free of all fat and connective tissue.

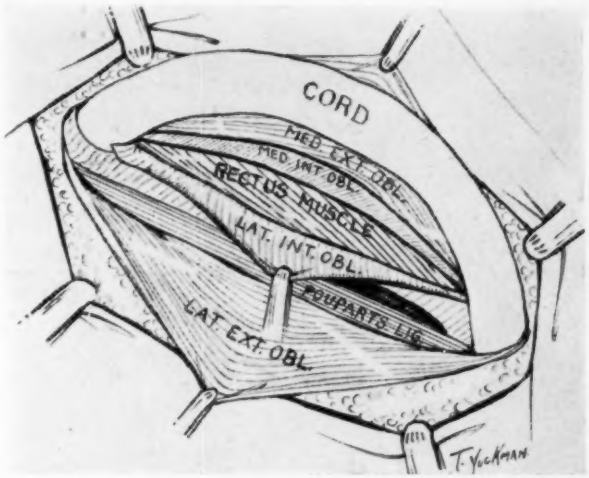

FIG. 3.—Aponeurosis of the internal oblique incised and lateral leaf of the internal oblique shown being turned over so the free border can be approximated to the shelving border of Poupart's ligament. At the internal ring the flap is to be closed snugly around the cord.

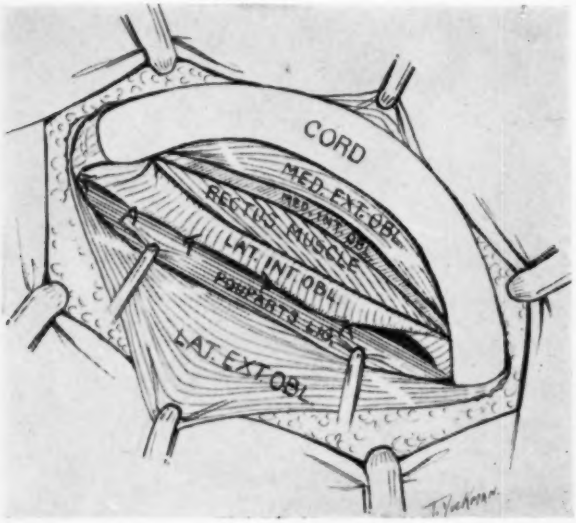

FIG. 4.—The lateral leaf of the internal oblique sewn to the lower border of Poupart's ligament around the internal ring, and there is one more stitch to be placed at the lower end of the canal which results in a complete new floor for the canal.

With a dry sponge Poupart's ligament is likewise wiped free of all fat and connective tissue over its entire length. Beginning just above the external ring, the lateral leaf of the internal oblique is turned over and sutured to the shelving border of Poupart's ligament with an interrupted No. 2 chromic stitch carried on a blunt needle. This apposition is carried upwards until the internal ring is reached. At the internal ring the leaf can be folded around the cord and held there snugly by two stitches, one above and one below the ring. The stitch placed above the ring is an important part of the technic. The lower portion of the new floor for the inguinal canal is closed by continuing the interrupted sutures in such a manner as to place the lowest one in the portion of the external oblique aponeurosis known as Gimbernat's ligament. By this method we have provided a new floor for the inguinal canal which is purely aponeurotic and under no tension.

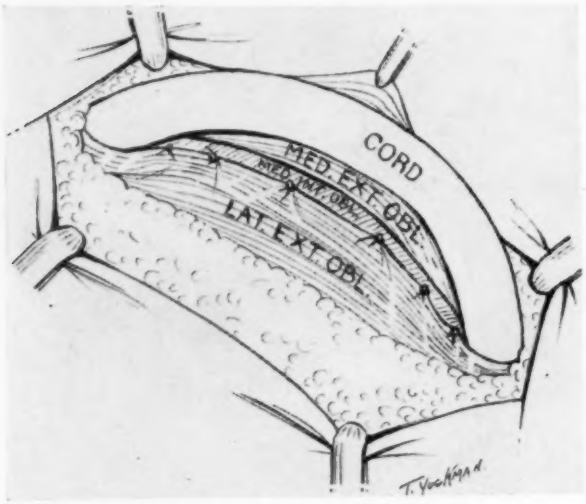

FIG. 5.—The lateral leaf of the external oblique drawn medially and sewn to the median leaf of the internal oblique.

The lateral leaf of the external oblique is now drawn under the cord and sutured by No. 2 chromic interrupted sutures to the medial leaf of the internal oblique in such a manner as to replace the portion of the aponeurosis which has been turned over to make the deep layer of the repair. At the site of the internal ring it is possible to again reinforce it by adding a suture above and below the cord.

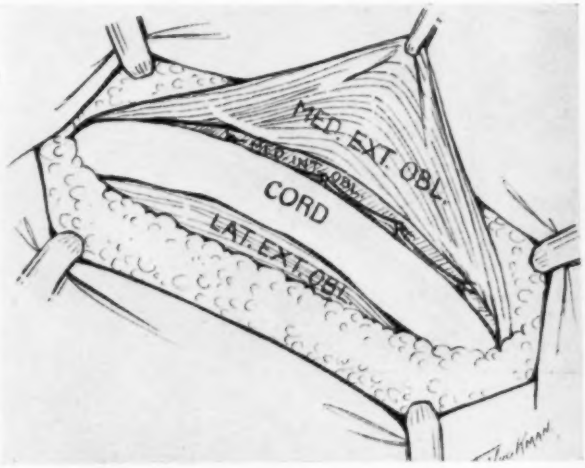

FIG. 6.—The cord dropped ready for covering with the last aponeurotic layer.

The diagrams accompanying this article show a method of placing the cord between the second and third aponeurotic layers. This is a matter of choice. It is sometimes advisable to transplant the cord directly under the

skin, the only difference in technic for accomplishment of either of these two methods is that in one, the medial leaf of the external oblique is brought under the cord, and in the other over it, suturing the medial leaf to the external surface of the lateral leaf of the external oblique and the fascia lata, taking care to close this last layer snugly around the cord at whatever point seems to be most advantageous.

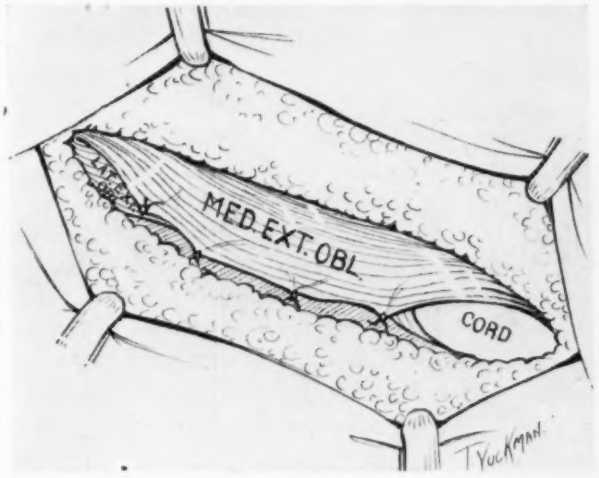

FIG. 7.—The median leaf of the external oblique sewn to the fascia lata and external portion of the lateral leaf of the external oblique.

The superficial fascia and skin are approximated by a continuous plain catgut subcutaneous suture and the skin edges approximated by skin plaster.

This type of hernia repair is also readily applicable to cases of direct inguinal hernia, the point of exit of direct inguinal hernia being below the deep epigastric vessels. After the inguinal canal is opened by splitting the aponeurosis of the external oblique, the hernia mass is found occupying the lower portion of the inguinal canal. In the cases where it is practicable, that is cases where the direct hernia sac is thick enough to permit of closure by suture, it is possible to open the sac, reduce the hernia and close the sac with a purse-string suture. But there are a great many cases of direct inguinal hernia in which the sac is so thin that the peritoneum will not stand closure by suture. In this type of case the method under discussion is most satisfactory. The median leaf of the external oblique is retracted medially and a flap of the aponeurosis of the internal oblique is developed in the same manner as previously described. By gently replacing the direct hernia within the abdomen, the aponeurotic flap of the internal oblique is turned outward and the place through which the direct hernia entered the canal closed completely. One may be more certain of cure in this type of hernia than in the indirect, because one does

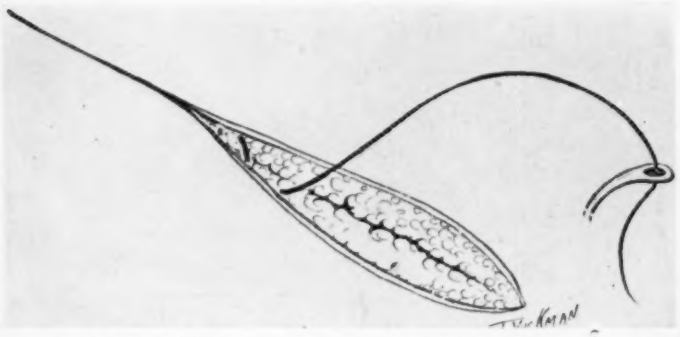

FIG. 8.—Incision being closed with a subcutaneous suture.

not have to allow for the exit of the cord when repairing the failure of development of the anterior abdominal wall. After the internal oblique flap has been sewn to Poupart's ligament, the remainder of the operation is carried on as previously described.

In an operation thus carried out, not only has the inguinal canal been reconstructed, but the joints of the reconstruction have been accomplished by the union of like-to-like tissues. No structures have been united under tension. The cord has been transplanted entirely out of the inguinal canal. We have introduced no foreign bodies. We have done nothing which is complicated. The method of repair is applicable not only to indirect inguinal hernia, but also to direct inguinal hernia.

We first used this method November 1, 1923. Since this time we have performed this operation on nine individuals; three of whom have had the procedure carried out on both sides, making twelve repairs in all, and to the best of my knowledge there are no recurrences.

I realize that this is too small a number of cases upon which to base any definite conclusion. It is in the hope that I can interest other operators in this procedure and assemble a larger experience for discussion that this preliminary paper is presented.

STRICTURE OF THE URETER*

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One of the most interesting studies the solution of which has resounded so greatly to the credit of the diagnostic acumen and technical skill of the American surgeon, has been that of ureteral stricture. Like many other advances of importance the pioneers in this field found themselves surrounded for many years by an army of skeptics. The intense driving spirit of a few courageous investigators has, however, finally triumphed, and their dogged persistence rewarded by a genuine recognition of the real value of their labors.

History.—For a proper classification of strictures it is necessary to divide them into congenital and acquired. The former have been well known and considered for a long time, and are fully discussed in the papers of Bottomley,[1] in the earlier writings of Eisendrath,[2] and particularly well brought out in his recent article.[3] In the present paper we are particularly interested in acquired stricture, the history of which is strange to say very brief. Our attention was really first called to it by Kelly [4] in 1902. In his epoch-making contribution, that writer makes this significant statement. "It is not a little strange that although enough has been written about stricture of the urethra to fill volumes, practically nothing, and next to nothing, practical has been said of stricture of the ureter." The work of Kelly marks the beginning of our studies in ureteral pathology and particularly as applied to stricture. It, however, remained for the first publication of Hunner's,[5] in 1916, to give the necessary impetus to the study of this lesion and its consequences in causing kidney pathology. To state that this subject has stirred up discussion in recent years is putting it rather mildly. Attempts to substantiate or disprove the claims of Hunner has, however, developed a large mass of interesting material.

Professional Attitude on Stricture of the Ureter.—In visiting the large European clinics one is particularly impressed by the fact that he seldom if ever sees cases diagnosed as stricture of the ureter. Further, one will not find ureterograms depicting. In many cases the continental surgeon when asked about the subject will shrug his shoulders at the mention of the title, or actually deny its existence. On more than one occasion we have heard it spoken of as the morbus Americani. There are several reasons for this attitude; in the first place, Röntgen pictures are not so readily available there as they are here. Second, one will rarely find an X-ray outfit as an integral part of the urological section, or at all handy. Aside from the above certain technic of ureterography as developed in this country are practically nonexistent in Europe. In America as well as in Europe, there has been an unfortunate reluctance to accept ureteral stricture as a distinct pathological entity.

* Read before the Northern Medical Society of New York City, February 5, 1925.

Anatomic Considerations.—In order that we may the better grasp the pathological anatomy and physiology of ureteral stricture, it will be well to review briefly the normal anatomy and physiology of these extremely important aqueducts. The ureters are musculomembraneous tubes, one on each side of the body, extending from the pelvis of the kidneys to the ureteral orifice of the bladder. The length of the tubes varies considerably in different individuals, but anatomists generally state their length as from 29 to 32 cm. The left ureter is generally a little longer than the right, as the latter is somewhat crowded by the liver. One frequently hears the ureters spoken of as retroperitoneal organs. This is essentially true, but requires a little more explanation than is usually allotted. The ureters drop down from the kidney pelvis for a short distance, in which they are supposed to be suspended; this is, however, usually but a few inches, and they become attached, or in many cases seem to be incorporated in the posterior layer of the peritoneum. The ureters when empty are collapsed, appear flattened, and on section the transverse cut presents a stellate appearance. The diameter of the tube is frequently given as ½ cm., but this is by no means uniform. In looking at the ureter we also notice several points of normal constriction, due to the circular group of muscles. That first noted is at the uretero-pelvic junction, the second where they pass over the iliac vessels, and the third in the intravesical portion of the ureter. In women there is also a constriction where the ureters pass through the broad ligaments.

The ureter on close examination is found to consist of three coats, an external fibrous, a middle muscular layer, and the internal layer or mucosa. The outer investment is rather loose and becomes a little denser as the ureter nears the bladder. The muscular portion is made up of an external and internal longitudinal layer. The mucosa is lined with columnar epithelium about four cells deep. The arteries which supply the ureter consist of branches from the renal artery and the afferent or extra renal arteries as described by Eisendrath.[6] These afferent vessels incidentally are quite a little more frequent than most of us have seemed to realize and should always be thought of in connection with renal surgery. In the middle of its course the ureter receives branches from the ovarian or spermatic arteries and toward its terminus small branches from the vesical arteries.

The lymphatics are found mostly lying in the adventitia and muscular layers and usually accompany the arteries. They form a rather complicated meshwork about the ureter and are said by some to be important factors in the production of ascending pyelitis.

As to the relation of the ureters to the surrounding organs, aside from their relationship to the posterior layers of the peritoneum which we have mentioned, they really have no definitely fixed course and relations. They seem to lie just beyond a line denoting the tips of the transverse process of the lumbar vertebra. In front of it we have the peritoneum and the large and small bowels. Posteriorly we have the psoas muscle, and it crosses the genito-crural nerve. The spermatic vessels usually pass in front of it. It is

also in fairly close relationship to the aorta and vena cava. When the ureter reaches the pelvis it crosses the common iliac vessels close to their bifurcation and on the right passes beneath the cæcum. Note well this last-mentioned relationship, as it is of very great importance in diagnosis. At this point frequently occur stricture and the lodging of stone. This fact is responsible for the removal of many an appendix. The ureter enters the bladder wall very close to the seminal vesicle, and toward the middle line. This relationship must be noted in the performance of seminal vesiculectomy or other operations in that area.

FIG. 1.—Well marked stricture of the left ureter, opposite the third lumbar vertebra.

Physiology.—The normal function of the ureter is to receive the urine from the kidney and conduct it to the bladder. The normal capacity of the ureter is from 1 to 5 c.c., while that of the kidney pelvis may vary from 2 or 3 c.c. up to 20 c.c. or more.

During the passage of urine the ureter undergoes a series of vermicular contractions starting at the pelvis, travelling at the rate of 20 or 30 cm. a second. From three to six contractions take place every minute. Peacock,[7] in studying ureteral contractions, found that a series of swellings of from 2 to 5 mm. long are seen along the course of the ureter during its contractions, due to the filling of the tube with urine. These contractions may also be produced by foreign bodies as stones; strictures also produce them. Temperature, blood-pressure and the nervous mechanism have a marked effect on ureteral peristalsis. Bodily position has no effect, however, nor does overdistention of the bladder. Reversed peristalsis was long a disputed question, but the researches of Lewis and Goldschmidt [8] have quite definitely established its existence. This phenomena has been demonstrated also by urographic pictures. In connection with the movements of the ureteral contractions urine is forced into the bladder. The way in which it is extruded

depends largely on the propulsive power behind the stream as well as the shape of the ureteral orifice. On watching a fairly large round or oval opening, it is at times almost impossible to see the extrusion of urine. In the small openings there is often a distinct wave seen and the urine is ejected with force. The current on discharge may be propelled in almost any direction. In this connection Caulk[9] has told us quite a little regarding the uretero-vesicle valve. Many question the existence of this valve and in a number of cadavers examined we were unable to identify it. Very distinct spasmodic action is often noted in normal ureters and one must be rather careful at times least this condition be diagnosed as stricture. This will often be noted on attempting to catheterize a ureter for the first time; relaxation usually overcomes it.

What is a Stricture of the Ureter?—In teaching cystoscopic and ureteral technic one is quite frequently asked the question just what is a ureteral stricture. With all due respect to those who have done such impressive work on the question of ureteral stricture, we must adhere to the fact that there is (as we have previously noted) such a thing as ureteral spasm, which will at times greatly interfere with our examinations. It is a similar condition to that in which one sees in the urethra at times upon passing a sound or other instrument. At times the resistance is so great as to make us think they are strictures, but a little pressure usually overcomes them. These may also be noted anywhere in the course of the ureter. A real stricture is a definite, permanent, pathologic intra-ureteral obstruction which is present at a particular location and never varies from it and is demonstrable not only by means of specially prepared catheters or bulbs, but by the ureterograms as well. In the pictures we should see a definite diminution of the ureteral lumen.

Incidence.—Hunner, who has certainly done more work than anyone else on this subject, in one of his late articles states that he has seen 2000 cases in eight years.[10] In an examination of several sets of urological records we have found stricture of the ureter noted as from zero per cent. up to about 20 per cent. In a very broad experience in urological work we seem to have found stricture present in about ten per cent. of cases requiring ureteral examination. Race or social status do not seem to have any bearing on the subject. They are apparently slightly more frequent in the female than in the male, and in all of our cases were noted between twenty and forty years of age.

In our series of cases the following figures approximately represent the incidence according to age.

Below 20 years, none; 20 to 25 years, 26 per cent.; 25 to 30 years, 28 per cent.; 35 to 40 years, 23 per cent.; over 40 years, 23 per cent.; according to sex: women, 53 per cent.; men, 47 per cent.

Etiology.—In discussing the etiology we may divide the cause of stricture of the ureter into traumatic, into that caused by other infectious processes, the so-called focal lesions, and that due to direct extension of disease processes.

Traumatic strictures are most commonly incident to childbirth injuries, or the performance of extensive gynæcological operations; as the Wertheim

amplified operation and other similar procedures; these are usually located close to the bladder. They may also follow vesical fistula. In view of the fact that the ureter is not a fixed, but easily movable organ, other traumatisms are really rare, particularly stab and gun shot wounds.

The discussion of focal infections has been most extensive and was first spoken of by Hunner in 1909.[11] If practically every acute infection may produce a focal lesion in another organ, there is no reason why it should not occur in the ureter. One of the diseases especially emphasized by Hunner is tonsillitis. Many people, however, have tonsillitis without lesions appearing in the ureter. In almost all of our own cases there was a record of some previous acute infectious process, often an infectious febrile disease or the exanthemata.

FIG. 2.—Well developed stricture of ureter, opposite fifth lumbar vertebra. Kidney shows evidence of a pyelonephritis, with marked flattening of upper and lower calices.

In an examination of 60 consecutive cases of stricture of the ureter: History of influenza was noted in 22. Scarlatina, 9. Variola, 3. Typhoid fever, 15. Pneumonia, 10. Cerebrospinal meningitis, 1. Total, 60.

Tubercular processes are positively causes of ureteral stricture. Pyorrhœa alveolaris has also been noted as a cause of ureteral stenosis. Such diseases as tonsillitis and pyorrhœa are so very frequent that they might well be included in the etiology of most anything. In the military services where tonsillitis is common, ureteral stricture is seldom noted, and those who have had repeated tonsil attacks have been under observation for many years.

As to the part played by the gonococcus as an etiological factor in stricture of the ureter, Kelly's [12] early work suggests that he regarded gonorrhœa as a common cause and then apparently changed his opinion. Venereal history is denied so often that when we see a lesion looking suspiciously like a gonorrhœal condition, question no further but treat accordingly.

One should rather expect to find the gonococcus as a cause, particularly in women where, as we all know, these infections have a much greater tendency to spread by the urinary route than they have in men. Garceau [13] believed the gonococcus to be the cause of the denser form of stricture. Hunner [14] does not lay much stress upon the gonococcus as a cause. Those of us, however, who have seen gonococcus infections by the thousands, know full well that the Neisserian infection will invade every single area of the genito-urinary tract, and we are consequently bound to consider this highly important organism as a factor in the etiology of any disease of these tracts. We have seen quite a few cases of gonococcus pyelonephritis, as well as ureteritis. The diplococcus of Neisser is an intense irritant and by no means the organism least capable of producing fibrous tissue. Wossidlo [15] has also noted numerous cases of gonococcus pyelitis and ureteritis. He also quotes numerous other authors as Mendelsohn, Asahard, Lewis, Marcuse, Casper, Pollitz and Gerster. From cases we have personally observed, it is our opinion that the extension of a gonorrhœal process from the urethra to the ureter is, at least in the majority of cases, by continuity of tissue and not by lymphatic conduction. In these cases the sequence is urethritis, trigonitis, ureteritis and stricture. It is not by any means our intention to state that the gonococcus is the most common cause of ureteral stricture, but believe it is no uncommon factor in that disease. In this connection the following case will be of interest:

S. E., male, age thirty-two. Seen January 2, 1924. Chief complaint, pain in left lumbar region. Family history unimportant. His general personal history is clear, except that he had an acute gonorrhœa about four years ago, another about eighteen months ago. He thinks he was cured of both.

Present Condition.—Patient states that about three months ago he began having frequent attacks of pain in the left lumbar region. The pain was sharp and lancinating, extending anteriorly as far as the glans penis. He frequently voids urine hourly and at times half hourly. Nocturia two or three times nightly. Urine is usually cloudy and often after sharp painful attacks it will contain considerable blood. Attacks are often accompanied by chills and fever, but these are not constant. No other symptoms are apparent.

Examination shows a large well-nourished man. General physical examination is negative, except that pain is elicited on pressure in left flank. Urine is cloudy, contains many flakes, specific gravity 1028, albumin and pus present, few red blood-cells. Prostate enlarged and mushy. Vesicles enlarged. Prostatic fluid contains much pus and some gonococci.

Urethroscopy, numerous glands in the anterior urethra show pus. Old hard infiltration noted at bulbomembranous junction. The colliculus is markedly enlarged. Left ejaculatory duct exudes a little pus. Purulent material issues from several prostatic ducts. Sphincter area shows considerable injection; marked trigonitis extending well up around left ureter. A slight amount of pus exudes from left ureter. On passing a number five catheter it met with a very distinct obstruction at about 10 cm. from the meatus. On withdrawing catheter it was found to contain considerable thick pus, which blocked its lumen. An examination of this pus showed organisms that were morphologically, culturally and tinctorially the gonococcus of Neisser.

This is not the only case we have seen, but it seems to emphasize the

point in question. Gynæcologists as a rule are inclined to treat lightly the question of cervical and parametrial infections in the etiology of stricture.

Lastly, syphilis should not be overlooked in relation to the cause of this condition.

Symptoms and Diagnosis.—The symptomatology of this disease is often misleading, as signs are not only distinctly local, but at times referred.

FIG. 3.—Multiple strictures in pelvic portion of ureter, location indicated by arrow.

The symptoms in the urinary tract are pain, which may be sharply localized at the point of stricture or over the kidney, the latter often being due to back pressure. Like all other diseases of the upper urinary ways stricture often gives rise to frequency and at times urgency. In addition, vesical and even rectal tenesmus may be present Hæmaturia is also a frequent symptom. It is not always present, but seems to appear most frequently during severe attacks of pain. Some patients complain that their pain is dull aching in character and present almost constantly. The other and more common type is the periodic paroxysms. The referred group of symptoms are usually gastro-intestinal, although Hunner has also noticed numerous cases in which mental conditions were suggested. Chills and fever are common, particularly where there is distinct evidence of urinary infection.

One striking fact appears to be brought out by students of ureteral stricture and that is its symptoms may simulate diseases that are almost too numerous to mention. The chief fact to bear in mind in regard to symptoms and diagnosis of stricture is that when we obtain symptoms suggesting a lesion of the urinary tract, that part of the anatomy should be thoroughly examined, when stricture will often be found. In the examination to be made in these cases:

1. As in all other diseases a careful history is of the utmost importance.

2. Careful inquiry should be made regarding obscure abdominal conditions.

3. The urine should be carefully examined. In some cases it will be absolutely normal, in another group many will present a hæmaturia and show many red cells per field.

4. Patients should be cystoscoped and the ureters explored with bulbous catheters or bougies. The wax-tipped bougies are of value, but not absolutely essential.

5. Carefully made ureterograms give us the last word in diagnosis.

To summarize we believe that a careful history, the pyelo-ureterograms and the therapeutic result of treatment are the main factors in establishing a diagnosis of stricture of the ureter.

The preparation of wax bulbs and technic of urography are not within the scope of this paper.

Pathology.—Very little opportunity is afforded in this country for the study of morbid anatomy of stricture of the ureter. It is true that very few persons actually die of this condition and our researches are greatly hampered by the great opposition to the performance of autopsies in this country. Unfortunately at such places as the Wiener allgemeine Krankenhaus with its 4000 beds and twenty daily autopsies, this lesion is not taken seriously.

In the limited number of cases we have been privileged to see, the location of the stricture has appeared as an area, showing acute or chronic inflammatory action. These processes vary from a small round-cell infiltration, with a small amount of fibrous tissue up to that of complete scarring and dense fibroses. In other words, the usual condition is not unlike that of urethral stricture. We can readily apply here the classification of Oberlander of soft and hard infiltrations of several degrees. Stricture may be annular or linear, but usually the former. The area may vary from a narrow band to a diffuse infiltration occupying a centimetre or more of the ureteral lumen. There are cases in which we have an associated diffuse interstitial ureteritis. In the latter cases we will often see on our X-ray plate a shadow which very distinctly suggests a stone. Suffice to say, ureterotomy has been done more than once in cases of this type.

Location.—Post-natal stricture may be found at the points of normal narrowing, or at any point along the ureter. Hunner [16] states that stricture is located in the broad ligament region or within 6 cm. of the bladder in by far the largest number of cases. The next most frequent location according to the same author is at the bifurcation of the internal iliac vessels or about 8 to 10 cm. above the bladder. These are close to the location of lymphatic gland groups. There are other writers who appear to agree with Hunner. It has, however, been our experience that they seem to appear about equally in the various parts of the organ. Thus out of sixty cases studied the location was at the uretero-vesical orifice in 3, at the lower third of ureter in 22, at the middle third in 17, and at the upper third in 18.

Some writers would hold that stricture only occurs at the normal con-

strictions, but we certainly cannot concede that. When strictures are bilateral, as is frequently the case, they are often at approximately the same level.

Stricture of the Ureter and Stone.—An interesting point which has caused no little discussion during the past year is that of stricture of the ureter and its relation to stone formation. Does stone cause the stricture or may the stricture not cause the stone. To the former we can state quite positively that a stone descending from the kidney and lodging at some point in the ureter would of course obstruct it, but that does not spell stricture. On the other hand, we have been thoroughly convinced not only by the work of Hunner,[17] but by our own researches that stricture does produce stone. Wherever we have urinary stasis there is the potential nucleus of a stone. In urethral obstruction, prostatic hypertrophy, vesical diverticula, dissecting trigone, etc., stones are quite common. In addition to the above, it is a noteworthy fact that most of these stones occurring in urinary stasis are of the phosphatic type. In a number of cases of ureteral calculi, which in my opinion were due to stricture, all of the stones were phosphatic. In several of these cases ureterograms and pyelograms have several times failed to show stones, while at a subsequent date a stone is discovered at or close to the site of the stricture. There is lots of room for research in this particular problem. One cannot help but be impressed by the frequency in which we see bilateral ureteral stricture and the large incidence of associated bilateral stones of phosphatic origin. It is also of interest to note that most ureteral stones are found around the so-called common sites of stricture. It is said that in these cases a little experience with the wax-tip bougies will always bring out

FIG. 4.—Multiple bilateral stricture of the ureter. Lesions are noted both in the pelvic and in the lumbar areas.

stricture. We cannot vouch for this statement however. It is reasonable to suppose that urinary calculi occur after acute infections similar to the formation of biliary calculi as noted by Rosenow and Neisser,[18] but it does not seem to us to be so common. The ability of the kidney to throw off hæmatogenous infectious material is astounding, as is readily noted in such diseases as typhoid. In these days of careful investigation it is unthinkable to operate for renal stone without a thorough exploration of both ureters for stricture. We believe that this procedure by establishing good drainage will save many kidneys and repeated nephrotomies.

Reno-renal Reflex.—We have heard much of this phenomena lately. It is our belief, however, that it is based on a very flimsy foundation. During the past few years we have examined quite a number of cases in which this so-called reflex was said to exist and in the vast majority found very definite evidence of stricture of the ureter; in several others well-marked extra-urinary pathology.

Prognosis.—The prognosis in ureteral stricture can in general be stated as good. It however depends to a great extent on the etiological factors involved. Where syphilis is the underlying disease, the prognosis should be good with appropriate treatment. In tubercular lesions the outcome will depend on treatment; local applications or dilations are of no value, nephrectomy or nephro-ureterectomy is required.

Treatment.—Like all other conditions, in ureteral stricture we must first endeavor to find the cause and when found remove it. Following the above the mass of material which has been summed up in regard to the treatment of this disease, may be expressed in a very few words. Dilatation through the cystoscope introduced into the bladder *via* urethra. In the female the use of the Kelly type endoscope and the use of stiff bougies makes the treatment a comparatively simple matter. In the male it is not quite so easy. We believe, however, that the perfection of cystoscopes of the McCarthy type will also simplify the treatment in men. As strictures are of large and small calibre, it is often necessary to use a very small catheter. In those of unusually small calibre which are practically impassable, one should not hesitate to resort to the use of filiform bougies in exactly the same way as we use them in the urethra. Most urologists seem to be impressed with the fact that a number five Charriere is the smallest sized instrument to be used in a ureter, rarely one sees a size four used. We usually see the interval between dilations given as ten days to two weeks. It is my custom to dilate as a rule once a week and I do not believe the interval too short.

In the use of ureteral dilators one should be careful not to dilate both sides (where bilateral stricture exists) at one sitting. Where this is done the trauma may produce contractions that will seriously delay treatment to say the least.

Care must also be exercised that one does not puncture the ureter. We

have come to the conclusion after seeing many people catheterize the ureters, at times with great force, that it is hard to puncture a ureter. However, on the other hand, punctures have occurred in the hands of the most expert. The use of wax bulbs at times often produce serious injury to the ureter. The degree of dilation necessary will depend entirely on the individual case. Dilate until one gets good drainage which seems to be reasonably permanent. Operative treatment of stricture is unsatisfactory and like all other ureteral surgery, should only be resorted to as a final expedient.

CONCLUSIONS

1. Stricture of the ureter is a definite pathological entity.
2. It occurs mostly between twenty and forty years of age.
3. It constitutes about 10 per cent. of the upper urinary lesions.
4. It is not purely a focal infection, but due to extension of disease by continuity as well.
5. It is more commonly a gonorrhœal process than is generally supposed and its pathology is somewhat similar to urethral lesions.
6. Symptoms are largely local.
7. Diagnosis may be made certain chiefly by history and X-ray, aided by ureteral bougie.
8. Treatment limited to dilatation.

The accompanying röntgenograms show clearly various phases of ureteral stricture.

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XANTHOSARCOMA OF THUMB

A CENTRAL BENIGN GIANT-CELL TUMOR OF THE PROXIMAL PHALANX OF THE THUMB

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Introduction.—The exceeding rarity with which benign giant-cell tumors occur in the phalanges makes it sufficiently interesting to report this case, which is one of the central xanthosarcoma variety, occurring in the proximal phalanx of the thumb. A review of the literature has revealed only one reported instance.[1] This was a typical benign giant-cell tumor occurring in the terminal phalanx of the great toe.

Fig. 1.—The patient's hand showing the relative size and location of the tumor mass with the dilated blood-vessels running over it. No lobulation is seen.

Case Report.—The patient was a white woman, thirty-six years of age, who came to the New Haven Dispensary complaining of a swelling on the right thumb, which she had had for the past three years. She dated the onset of her trouble from a bruise which she received three and a half years previously. Three years ago she noted for the first time a lump the size of a pea, on the inner aspect of her thumb. It gradually increased in size until a year later when it was incised by her physician who considered it to be an abscess. The incision bled freely but no pus or fluid was obtained; the wound healed in about two weeks. The tumor had, however, gradually increased in size until her visit to the New Haven Dispensary. It had never given her any discomfort except for one brief attack of sharp, shooting pain five months ago. It had never been reddened nor inflamed. She sought medical aid chiefly on account of the deformity. Her personal and family histories were irrelevant.

The general physical examination was negative insofar as it concerned the local condition. On the medial and dorsal aspects of the right thumb lying over the proximal phalanx was a tumor mass (see Fig. 1) about 2 cm. in diameter and raised above the thumb for a distance of 1 to 1½ cm. The skin over it was dry and rather shiny and running over both sides one could see small dilated veins immediately under the skin. On

inspection the tumor appeared to be uniformly smooth and globular. On drawing the skin tensely over the tumor one got the impression that it was lobulated. On palpation the tumor was uniform in consistence, somewhat soft and elastic, and gave the sensation of fluctuation. There was no redness or induration of the surrounding tissues nor any œdema, pain or tenderness. It was loosely but definitely attached to the underlying structures while the skin over it was freely movable. What could be felt of the adjacent phalanx was smooth. There was, however, a very definite visible and palpable bulging of the centre of the phalanx on its lateral aspect.

FIG. 2.—The X-ray shows in the centre of the proximal phalanx of the thumb a well marked area of decreased density with well defined edges as well as a second area of rarefication nearer the distal end of the phalanx on its dorsal and medial aspect. No new bone formation can be seen in the bone nor in the tumor mass in the soft parts.

The routine laboratory findings were not remarkable. The X-ray of the thumb showed in the central portion of the proximal phalanx of the thumb an area of well marked decreased density, the edges of which were sharply cut and smooth in appearance. On the dorsal and medial surfaces of the distal end of the phalanx there was also considerable destruction of the bone which was more or less regular in outline. In addition one saw a well marked swelling of the soft parts of the dorsal and medial aspect of the proximal phalanx of the thumb. There was no evidence anywhere of new bone formation in either the bone or the adjacent soft parts. (See Fig. 2.)

In spite of the lobulated appearance, the superficial veins and the previous history it was thought wise to explore the tumor mass with an aspirating needle and syringe. The needle went through skin, into the tumor and then all the way through the tumor till one could feel bone with the tip of the needle. The sensation was that of going through solid, firm, tissue. No fluid was obtained excepting a small drop of blood.

Operation.—November 12, 1924, the tumor was explored under 1 per cent. novocaine anæsthesia. Immediately underneath the skin one came upon a definitely encapsulated and lobulated tumor mass. This was readily shelled out by blunt dissection until the bone was reached. Here it was found that the tumor mass extended through an opening about 0.5 x 0.3 cm. into the marrow cavity of the phalanx. The tumor tissue filled the entire marrow cavity. It was removed and the cavity was thoroughly curetted with a sharp curette. Very little bleeding was encountered. After the curettage the cavity was cauterized with 95 per cent. phenol followed by alcohol and then packed with a gauze pack soaked in 50 per cent. zinc chloride solution. A drain was left in the wound and the wound

closed with interrupted silk sutures. Up to the present (more than two months since operation) there has as yet been no evidence of recurrence.

Pathologic Note: Gross Description.—The specimen consisted of two similar pieces of tissue. The surface of the larger piece of tissue measured approximately 2 x 1½ x 1½ cm. (Fig. 3) was definitely lobulated and seemed to be almost entirely encapsulated. It had a yellow appearance, excepting over one small area measuring about 0.5 x 0.3 cm. which had a brownish-blue color. It was rather soft but firm in consistence. On section of the main tumor mass (Fig. 3a) one found it to be uniformly solid and for the most part of a bright yellow color, although there were some areas in which the rather brownish-blue area extended into the centre of the mass. The whole of the smaller piece of tumor (removed from the marrow cavity) was used for microscopic section. A block was also taken through the larger tumor mass for microscopic examination.

FIG. 3.—This view of the main tumor mass shows the superficial blood vessels and the definite lobulation.

Microscopic Note.—The sections through both pieces of tissue were similar in structure. The sections showed that the piece of the tumor which was outside of the bone was almost entirely surrounded by a thin fibrous connective tissue capsule. The stroma consisted of fibrous connective tissue which in many areas had become hyalinized (Fig. 4) in other areas, however, it was more loosely arranged and occasional mitotic figures could be seen. Here too the capillarities were more numerous and there was some extravasated blood. In these areas one found large numbers of the multinucleated giant cells (Fig. 5) which were also scattered throughout the remainder of the section. They varied somewhat in size but were otherwise uniform in appearance. They had a slightly granular pink staining cytoplasm and ovoid vesicular nuclei. In the meshes of the stroma there were present, in several areas, collections of large polygonal cells (Figs. 6 and 7) with a clear but somewhat granular cytoplasm. The nuclei which stained deeply with hæmatoxylin were small and rounded, the cytoplasm being correspondingly great. These are the cells commonly known as "Xanthoma cells."

FIG. 3a.—The tumor having been cut in half shows the very definite capsule as well as the uniformly solid nature of the tumor.

Diagnosis: Benign giant-cell tumor, xanthosarcoma variety.

Comment.—Chondromas and myxomas are the common central tumors of the phalanges. Bloodgood reports three cases of chondroma of the phalanges.[1] To this McWhorter [2] adds one and Buxton [3] another. In the same article Bloodgood mentions two unquestionable cases of myxoma and two others which very probably are myxomata. There are also reports of occasional cysts of the phalanges. Under the heading of benign giant-cell tumor and its variants, Ewing,[4] in his review and classification of bone sarcomata, includes the group of tumors known as the xanthosarcomata which are so designated on account of the presence of large numbers of xanthoma or foam cells which give the tumor a yellow color. The giant-cell tumors of the xanthoma type are most commonly associated with the tendon sheaths and the aponeuroses. Spiess [5] collected 44 cases from the literature and had five cases of his own, which he described in minute detail. Merrill [6] described a case of xanthoma showing multiple bone lesions, which he says must be differentiated from arteriosclerosis and gout as well as from multiple cysts, osteomyelitis, tuberculosis, and

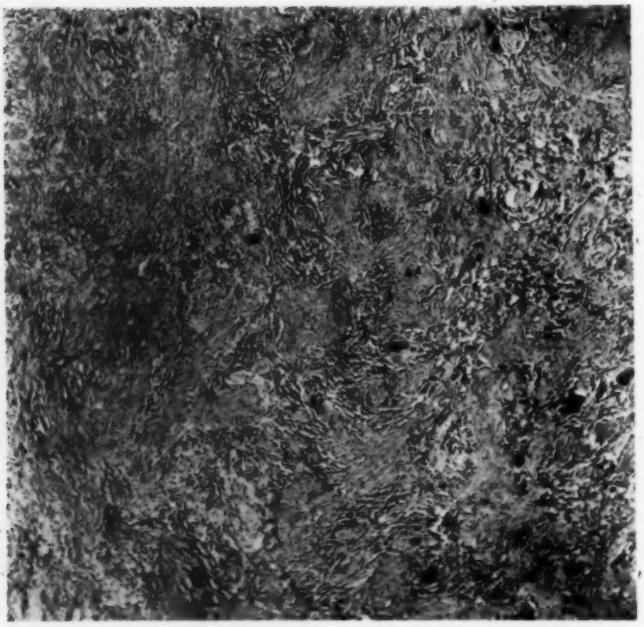

FIG. 4.—This photomicrograph gives the general appearance of the fibrous connective tissue stroma showing areas of hyalinization. Scattered throughout the picture are occasional giant cells and along the lower border as well as in the left hand lower corner are many xanthoma cells.

syphilis. According to Merrill: "Multiple cysts and osteitis fibrosa involves deeper bones with cyst formation, abnormal trabeculation, thinning of the cortex and often expansion of the weakened area, sometimes with spontaneous fracture." Kusnetzowky[7] also reports a case of multiple xanthomatous granulomata in the tendons. None of these xanthomatous tumors, however, showed evidence of marked bone destruction or of actual invasion of bone. A few showed slight bony changes and an occasional tumor was attached to the periosteum.

In the case here reported we are unquestionably dealing with a central bone tumor of the phalanx which, however, differs from the typical benign giant-cell tumor in many respects in spite of its containing numerous multinucleated giant cells. In the first place it involves the diaphysis rather than the metaphysis of the bone. It is devoid of a bony shell or capsule. It has not expanded the

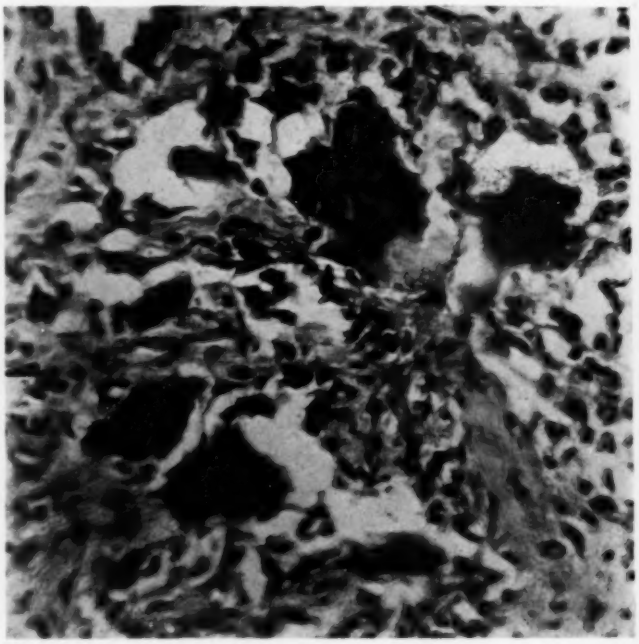

FIG. 5.—This photomicrograph shows an area in which the stroma is more loosely arranged. There are several multinucleated giant cells present showing their slightly granular cytoplasm and ovoid vesicular nuclei.

marrow cavity nor thinned out the cortex, but has merely eroded through the cortex and pushed the surrounding tissues out of its way without invading them. The larger portion of the tumor is a rather yellow, lobulated and encapsulated growth outside of the bone itself, nevertheless, intimately connected with that portion of the tumor occupying the marrow cavity. It is a relatively avascular tumor, very little bleeding being encountered at operation. Grossly, on section it is uniformly solid and firm in consistence, containing no areas even suggesting hemorrhage, excepting one brownish patch of tissue, nor of tissue resembling vascular granulation tissue which is so characteristic of the benign giant-cell tumor.

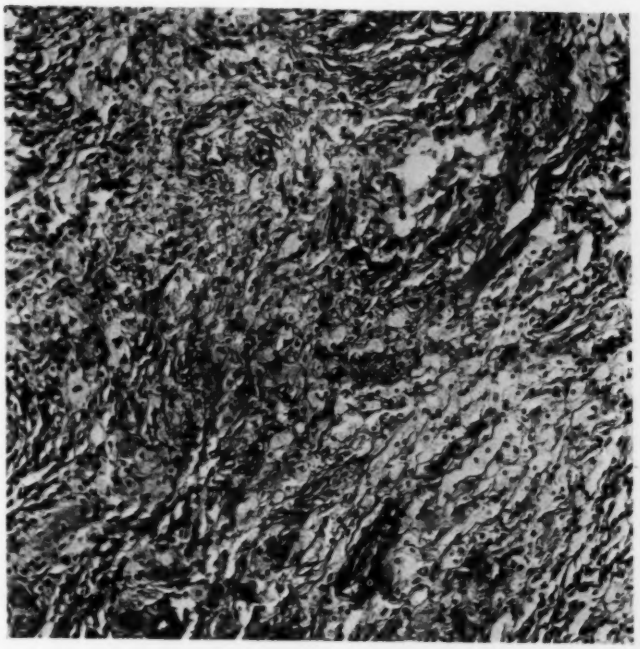

FIG. 6.—A low power view of a portion of the stroma in which many xanthoma cells are embedded.

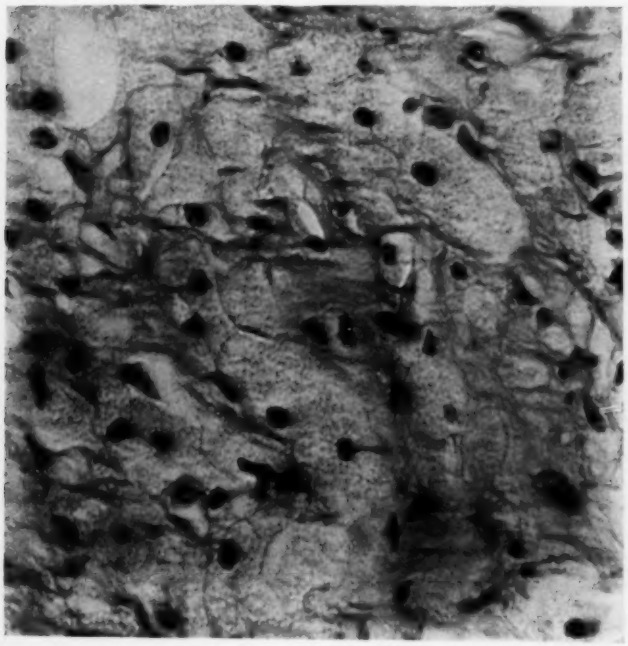

FIG. 7.—An area of xanthoma cells magnified 500 diameters. Here one can definitely see their polygonal shape; their clear granular cytoplasm which appears correspondingly great when compared with the small, rounded, vesicular hyperchromatic nuclei.

Microscopically it consists of a rather avascular fibrous connective-tissue stroma in the meshes of which are numbers of large polygonal cells with small pycnotic nuclei and rather granular, clear cytoplasm (xanthoma

cells). Then, too, where the stroma is more loosely arranged large collections of the epulis type of giant cells are embedded in it. On the whole we have thus the picture of a central bone tumor which one would consider as belonging to the xanthosarcoma type of the benign giant-cell tumor.

SUMMARY.

The case reported is that of a central benign giant-cell tumor of the xanthosarcoma variety, occurring in the proximal phalanx of the thumb. There is also a brief review of the literature on this subject including the more common bone tumors of the phalanges.

In conclusion I would like to thank Dr. Willis E. Hartshorn and Dr. Samuel C. Harvey for the privilege of reporting this case.

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KIENBÖCH'S DISEASE OF THE SEMILUNAR BONE*

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From the Out Patient Surgical Service of the University Hospital

Fracture of the semilunar bone (os lunatum) is a condition of comparative rarity. The ordinary traumatic lesion, generally the result of great direct violence, occurs occasionally, and of fractures of the bones of the carpus is second in frequency to those of the scaphoid. Statistics concerning its incidence from various clinics exhibit a rather wide divergence. Plagemann's [1] figures, from Müller's surgical clinic at Rostock, based on radiographic diagnosis of one thousand three hundred ninety-three (1393) fractures, show five (5) cases of fracture of the semilunar bone, or 0.395 per cent.; Oberst reports two (2) cases out of one thousand seven hundred fifty (1750) fractures of all bones, or 0.114 per cent. At the hospital of the University of Pennsylvania, there were only seven (7) cases in over ten thousand fractures of all bones, or .07 per cent. Of these one was merely a slight sprain fracture and two others were complicated by fractures of other bones, one scaphoid and one radius.

Kienböch's disease is the name given by Speed [2] (the only writer in English found by the author to describe the condition) to a lesion characterized by fracture of the semilunar bone, usually comminuted, associated with partial absorption of its fragments. A distinguishing feature is the absence of history of trauma violent enough to account for the severity of the lesion; indeed, in many cases no history of violent trauma can be elicited. The condition was first described by Peste in 1843, but was not widely recognized until 1910, when it was again brought forward and discussed from the standpoint of the röntgenologist by Kienböch.[3]

All published cases of fracture of the semilunar, prior to 1909, have been listed by Finsterer.[4] Saupe [5] lists fifty (50) cases of Kienböch's disease. Of these Becker reported twenty (20), Kienböch sixteen (16), Guye seven (7), Finsterer six (6) and Saupe one (1).

According to Saupe, this condition occurs seven times as frequently in males as in females. Among the latter, domestic servants are most often affected. The right wrist is involved about two and a half times as often as the left. The lesion is found for the most part in individuals in the third or fourth decade of life. When there is a definite history of trauma—and this may be obtained in the majority of cases—a fall on the dorsally-flexed hand is the most common. At times, however, no history of accident can be elicited.

Kienböch believes that the lesion is produced by a momentary, spontaneously-reduced luxation, in the course of which there is an avulsion of

* Read before the Philadelphia Academy of Surgery, January 5, 1925.

the dorsal ligaments with tearing of the most important blood-vessels. Guye and Shoch [6] believe the same mechanism to be causative. Kienböch thus applies to the semilunar the theory of Preiser concerning the scaphoid. Whether or not, without slight fissure of the bone or even a tear of the ligament, a rupture of the vessels may occur, is undecided. It is certain, however, that a bone damaged by such a primary trauma can, under the constant slight traumata of daily life, undergo secondary fracture.

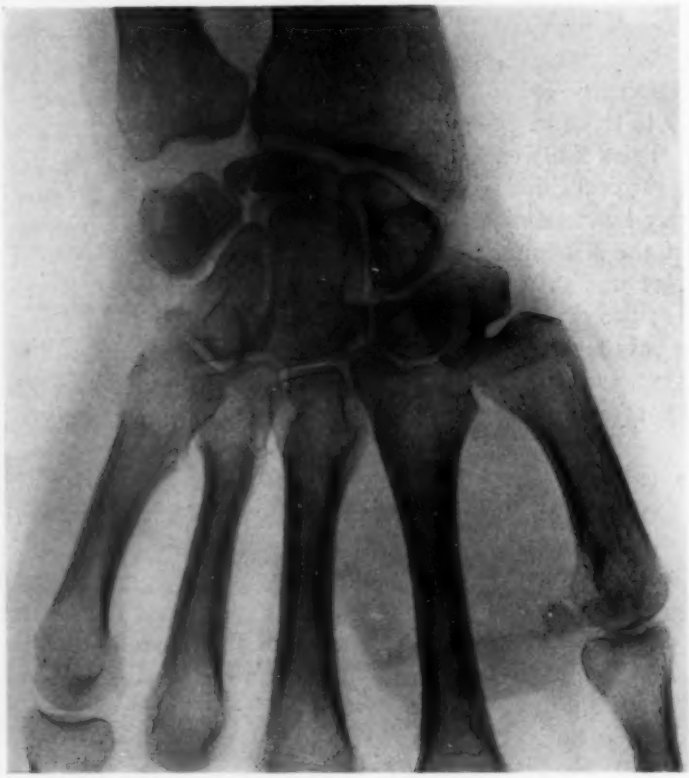

FIG. 1.—Case I. Condition at first examination.

W. Müller [7] recognized three forms of the condition, classified according to their etiology:

1. Anatomical form—due to abnormal pressure lines from anatomical anomalies.

2. Occupational form—due to repeated minimal traumata.

3. Traumatic form—due to a single marked pressure insult.

He believes that the traumatic type of semilunar injuries is more rationally explained by the theory of pressure insult than by the more common one of ligament tear and consequent nutritional disturbance.

There are four stages of the syndrome, each merging gradually with its successor. The first stage, that of joint irritation immediately following trauma, is comparatively short, generally persisting not more than one or two weeks. There follows a period of relative freedom from discomfort lasting several months. This is followed by the actual disease stage with more severe symptoms. Finally, after several months the acute symptoms subside into a stage of moderate disability, which, as well as the X-ray findings, remains unchanged for years.

In the typical case, there is pain in the region of the semilunar bone, at times when the wrist is at rest, at others only upon motion. There is swelling

of the wrist, usually of mild or moderate degree, especially on the dorsum and the volar side. Sharply localized tenderness to pressure over the bone is an important sign. Occasionally there is a bony prominence below the articular extremity of the radius. Finsterer states that two signs, if present, are almost pathognomonic. They are: (1) The head of the third metacarpal is on the same level as those of the second and fourth, while normally it is more prominent. This is, of course, due to partial absorption of the semilunar, allowing the third metacarpal to be retracted; (2) pain localized over the semilunar bone on tapping the head of the third metacarpal with the fist closed and the hand in ulnar adduction.

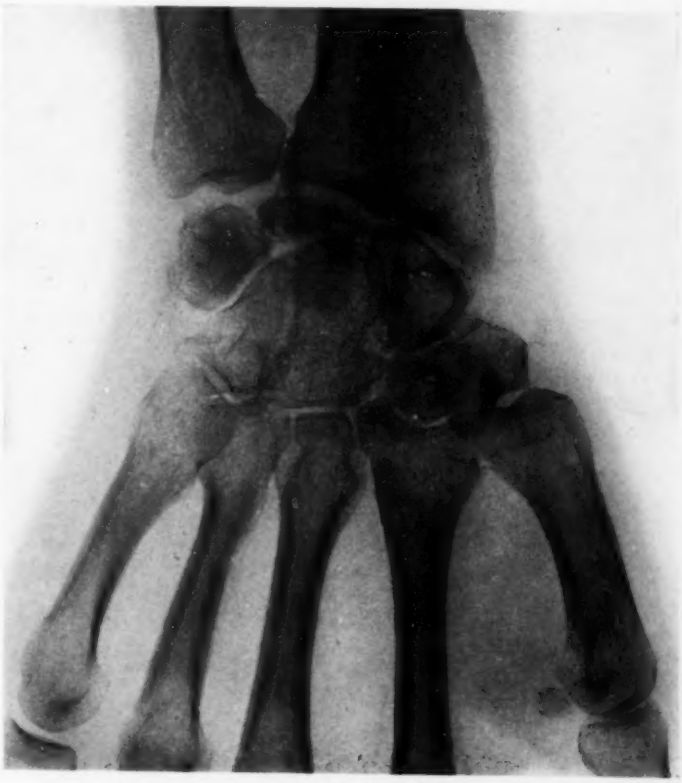

FIG. 2.—Case I. Condition at second examination, one year after first.

Pronation and supination of the hand are well performed, but there is moderate limitation of flexion and extension. The act of pushing with the hand is not as well performed as pulling.

The diagnosis is made by the X-ray.

The condition is easily confused with sprain or chronic arthritis because of the comparative mildness of the symptoms and of the frequent absence of a definite traumatic history. The fact that no case reports have been found in American publications suggests that the syndrome may be overlooked unless the aid of the X-ray is invoked.

CASE I.—L. J., age twenty-two, white, female, has for four years worked upon a machine which she has operated by pulling a handle with the right hand. For the past year she has noted difficulty in the performance of flexion and extension of the right wrist. The wrist is painful when held in one position for any length of time. The hand feels cramped and there is some subjective loss of power, especially in flexion. The patient is totally unable to recall any severe trauma to the right hand or wrist at any time in her life. Examination reveals moderate tenderness to deep pressure over

the semilunar bone. There is slight swelling of the carpus. Limitation of flexion and extension is noted in about equal degree. No limitation of ulnar or radial flexion; no retraction of third metacarpal head. Grip slightly weaker on affected side. Tapping of third finger with wrist in ulnar flexion causes some discomfort over semilunar bone. X-ray reveals comminuted fracture of the semilunar with some absorption of the fragments but no displacement. (Fig. 1.)

Immobilization of the wrist joint for four weeks had no effect. Operation was suggested but not urged in view of the non-disabling character of the lesion. Patient declined operation. She changed her occupation to that of telephone operator.

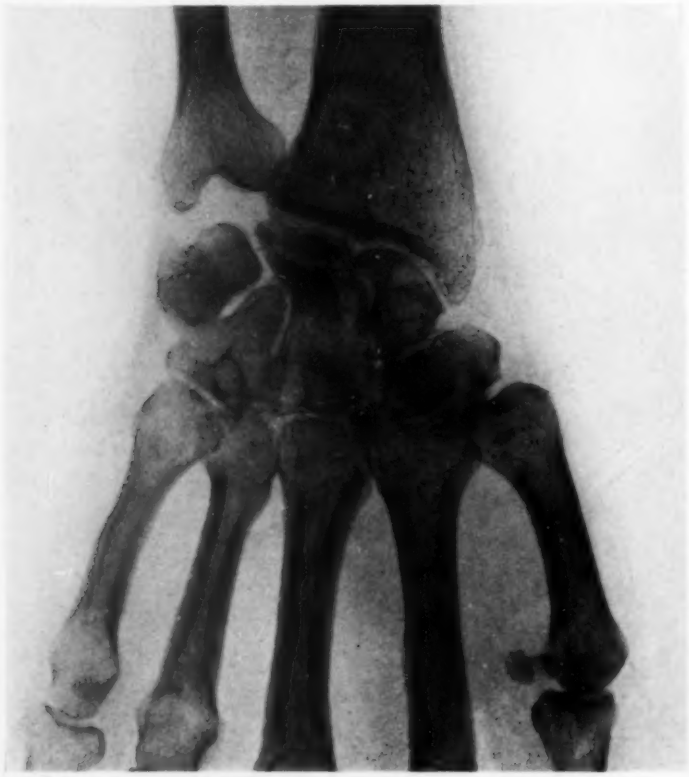

FIG. 3.—Case II.

One year later her condition was unchanged except that absorption of the semilunar fragments had progressed somewhat. (Fig. 2.) The physical signs remained practically the same and the patient stated that although the wrist was "a little lame," it was not really painful, and did not interfere with her occupation.

It is interesting to note that Saupe's case is very similar to the above. It occurred in a girl of twenty-three employed as a motorman on a trolley car. There was no history of severe trauma, but symptoms followed repeated pulling of the controller handle. The X-ray here showed absorption of half of the bone, with fracture.

CASE II.—E. D., age thirty-nine, white, female. Twenty years ago patient had her right arm and wrist caught between the rollers of a washing machine. She does not know whether or not she had a fracture, but she recovered full use of the part in a short time and had no trouble until about two years ago. At this time she began having pain in the wrist, which has become worse in the past two months. The pain was accompanied by swelling and considerable disability. There was no history of recent trauma but patient states that she had been lifting her invalid husband a great deal of late. Examination shows moderate swelling of the wrist and tenderness over the semilunar. Limitation of motion is as follows: Extension a little less than half normal, flexion two-thirds normal, pronation and supination normal; slight limitation of radial flexion, moderate ulnar deviation. X-ray reveals comminuted fracture of semilunar with partial absorption of fragments. (Fig. 3.)

Treatment consisted of splinting, massage and baking, without improvement. Nine months later the wrist was found to be lame and painful and the seat of a slight uniform swelling. There is 25 per cent. limitation of flexion, 50 per cent. limitation of extension, slight limitation of adduction, none of abduction. Grip is decreased about one-third. No retraction of third metacarpal. Pain over semilunar on tapping third knuckle with hand in ulnar flexion, but none when hand is in radial flexion. Tenderness throughout the wrist most marked over semilunar. Patient refused operation.

CASE III.—J. D., age thirty-one, white, male. This man stated that he sprained his wrist eight months ago, as the result of a fall on the outstretched hand. Later he injured the wrist again lifting a heavy log. At present, examination shows swelling of the wrist, tenderness over the semilunar, and limitation of flexion and extension. X-ray reveals sprain—fracture of the semilunar without comminution but with some absorption of the bone. (Fig. 4.) Efforts to trace this man were unavailing and there are no further notes on his condition.

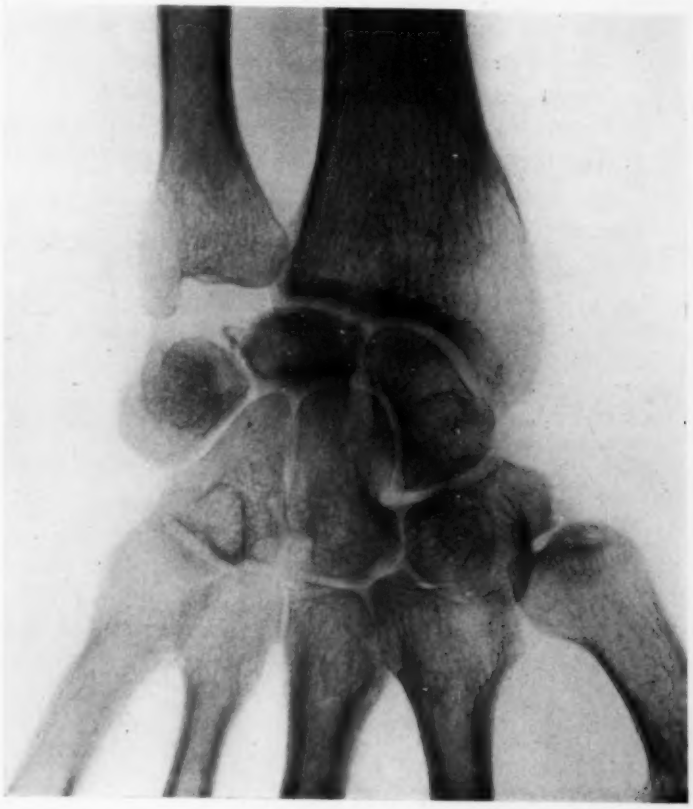

FIG. 4.—Case III.

In early cases conservative treatment should be instituted. This consists of immobilization for four to six weeks, with dorsovolar pressure and extension to middle finger.[8] Massage and electricity may be employed to avoid atrophy. In established and advanced cases, treatment depends upon the degree of disability. Operation is indicated if there is a very troublesome degree of discomfort and weakness. The operation of choice is extirpation of the entire bone. Since, however, complete restitution of function rarely follows operation, one hesitates to advise it in cases with only mild derangement of function. Müller[9] reports one case of cure by complete extirpation of all bone débris, leaving behind a shell of bone, but this is an exceptional result. In a word, the prognosis is entirely favorable only in beginning cases. Years after operation untoward symptoms may supervene.

SUMMARY

1. Kienböch's disease of the semilunar bone, or traumatic nutritional disturbance with atrophy, with or without fracture, is a condition of rare occurrence, but is probably occasionally overlooked or diagnosed sprain or "rheumatism."

2. The lesion may occur as the result of severe trauma, oft-repeated minimal traumata, or possibly from anatomical malformation.

3. The symptoms are wrist-joint disability, local pain and tenderness, and sometimes retraction of the head of the third metacarpal bone.

4. The diagnosis is best made by the X-ray.

5. Treatment is conservative in the early stage, operative in older cases.

6. Prognosis for complete return of function is not good.

7. The literature is reviewed and three cases are reported.

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MICROSCOPIC EXAMINATION OF FRESH TISSUE, AND NECROPSY SERVICE IN RELATION TO SURGERY*

By Louis B. Wilson, M.D.
of Rochester, Minn.

By the nature of his specialty the surgeon has always been a morphologist. He may have had an excellent knowledge of function, but unless he could find evidence of disease in terms of anatomy or pathology, he has left treatment to the physician. The surgeon of yesterday, concerned as he was with devising operations to correct hitherto uncorrected lesions, perhaps had greater need of more constantly extending his knowledge of normal anatomy than has the surgeon of to-day, when operations for so many diseases, and the knowledge of the essential anatomy on which they are based, have become commonplaces. The extensive descriptive literature, covering the essentials of the anatomic and pathologic conditions underlying the enormous number of what perhaps may be styled standard surgical operations, is now so complete and so available that any surgeon, on the basis of the usually good training in anatomy he has received in medical school and in graduate study, may readily inform himself of the usual facts without the frequent recourse to the dissecting room, so necessary to the pioneer surgeon. But as is usual with all forms of progress, the attainment of this desirable high level, instead of furnishing an excuse for inertia, has only brought out more than ever before, the necessity for more extended knowledge along other related lines thus brought into prominence. Two of these fields which are now most important to the surgeon are the extension of his knowledge of the microscopic pathology of disease in time to be of assistance in the treatment of the patient in whom the lesion is found, and the extension of his knowledge of the primary and associated pathologic conditions in the patient who dies after operation.

In making a biopsy in a doubtful case, usually under the euphemism of an "exploratory operation," the surgeon may obtain for himself directly the gross evidence of disease, but because of his preoccupation at the time, he usually cannot conveniently obtain for himself directly the microscopic evidences of disease. If he attempts to make his own microscopic study, time is wasted and the patient's life may be endangered. For, especially in malignant disease, there is real danger of hastened dissemination of a tumor from which a specimen has been taken unless operation immediately follows the biopsy. Fortunately, improvements in the technic of preparation of tissue for microscopic examination in the last twenty years [1, 2] have made it possible for the pathologist who receives tissue immediately after its excision to give to the surgeon a dependable diagnosis within a very few minutes after

* Read before the Southern Surgical Association, December 9, 1924.

the receipt of the specimen, thus enabling the surgeon to complete the operation at the first session, and with a minimal delay. The necessity for this assistance from the pathologist to the surgeon is becoming greater and greater in the field of malignant disease as the public is coming more and more to realize the importance of seeking surgical advice at the very beginning of any process which has been described to them as possibly cancer. Malignant tumors do not spring up overnight, mushroom-like, in grossly diagnosable form. In the recognition of the beginnings of cancers, especially of those forms which take their origin in chronic irritative processes, there are always somewhat lengthy periods in their history in which accurate diagnosis by gross appearance alone is impossible. It is in these stages of border-line development that, if our teachings of the public have any effect whatever, we may expect more and more malignant tumors to be presented for diagnosis. It is also in these stages that we can hold out to the patient greater hope of operative success. *But the surgeon who urges patients to come earlier for diagnosis of malignant tumors is under moral obligation to provide adequate means for the immediate microscopic diagnosis of early lesions when the patient takes him at his word and comes early.*

It is not in the microscopic diagnosis by the examination of fresh tissue from the primary lesion alone in which the pathologist may be of aid to the surgeon. In many instances the microscopic examination of related tissues may aid the surgeon in determining the extent of progress of malignancy. Indeed, not infrequently the pathologist may be able to give a more positive diagnosis from the examination of a nearby gland than from the examination of the primary tumor, if the latter is masked by associated inflammation.

The amount of the necessary work in the microscopic diagnosis of primary lesions and of extensions therefrom in a modern surgical clinic, few of us realize. MacCarty, two years ago, in summarizing the recent experience of the Mayo Clinic, reported that "of 47,434 surgical specimens, 18.2 per cent. required a microscopic diagnosis." MacCarty further says, "Five and seven-tenths per cent. of all surgical cases which produce surgical specimens have tissue removed for diagnosis during operation." "Two and sixty-five-hundredths per cent. of all surgical patients who produce surgical specimens have pathologically incorrect clinical or pre-operative diagnoses. Of these (2.65 per cent.) 60 per cent. require quite different surgical procedures as a result of the microscopic diagnosis as a control on the clinical diagnosis."

The examination of fresh tissues during the progress of the operation is of almost as great value for the information it gives the surgeon concerning the nature of chronic inflammatory processes, especially of tuberculosis, as it is in relation to malignant processes. In either case it is indispensable to the surgeon who would give the best possible service to his patient.

One word of caution is necessary. The surgeon usually assumes the responsibility for the selection of material for microscopic examination in those cases in which he feels the necessity for a pathologic diagnosis before proceeding with his operation. In making this selection he needs to exercise

excellent judgment of gross pathologic conditions. In this he can be greatly assisted by the pathologist who should be at his elbow. He needs also to remember that not infrequently the most readily available tissue does not contain the most readily diagnosable histologic lesions, while on the other hand the obtaining of more difficultly available tissue may endanger the patient's life. And the surgeon must bear in mind that while the pathologist's positive diagnosis is final, the value of his negative report must be judged by the surgeon's own judgment of the accuracy with which he himself has selected the sample of tissue on which the pathologist's report has been made.

I would make the further suggestion, though it more directly concerns the pathologist than the surgeon, that the pathologist who receives specimens for immediate examination only from those occasional cases in which the surgeon thinks the clinical diagnosis may be doubtful, cannot gain sufficient skill because of lack of sufficient variety of material and lack of controls to make his pathologic diagnoses of much dependability. There is only one right way to provide dependable pathologic assistance to the surgeon at the operating table; that is to have every specimen of every sort which is removed at operation placed immediately in the hands of the pathologist who must have adequate means for its immediate examination. And the pathologist must also, at least until he has gained confidence by years of experience, check all of his diagnoses on the histologic examination of fresh tissue, not only by the subsequent microscopic examination of fixed tissue, but also, and, what is perhaps even more important, by the careful study of the subsequent histories of the patients from whom the specimens were obtained, as well as by the necropsy records when necropsies can possibly be obtained. And this leads me to a consideration of the second portion of my subject, namely, the necropsy service in relation to surgery.

Too frequently the post-mortem examination is looked on as a means for determining only the cause of death. This, of course, is one of its important functions, since without it our vital statistics are of very questionable value in all except acute, and a few chronic, infectious diseases, deaths from traumatism, and so forth. The percentage of error in clinical diagnoses, even after surgical operation, is very high in malignant diseases and in all chronic functional diseases. We must have a very greatly increased percentage of necropsies in the United States if we are to have our vital statistics placed on a par with, for example, those of England. If the public realized the importance of this they would demand necropsies.

But the accurate determination of the cause of death, important as it may be for statistical purposes, is, to the physician and surgeon, a relatively unimportant function of the necropsy. The surgeon may be absolutely certain of the character of the disease of the patient from his clinical examination, his gross examination at operation, and the microscopic diagnosis of biopsy material by an associate pathologist. He may have operated in perfect confidence of a favorable result. The most careful post-operative study of the patient may have yielded no indication of why the result was not favorable,

and yet the patient has died. Now, if the surgeon is to improve his diagnostic and his operative judgment, he must seek to acquaint himself with all the reasons why the patient died, and his only hope under the circumstances detailed is by a careful post-mortem examination. The picture I have sketched is not that only of the unusual post-operative death. I venture the assertion that necropsies made as a routine on the early post-operative deaths occurring in the practice of any good surgeon will show important factors in the cause of death unknown to the surgeon in more than half of the cases. These factors concern unsuspected extensions of the primary diseases, the unsuspected presence of lesions in vital organs which were thereby so weakened that the patient was unable to withstand the shock of operation, and, not infrequently, errors in technic in the operation itself. Preliminary to any important operation, the surgeon can readily inform himself of the ordinary anatomic conditions, of the ordinary pathologic lesions, and of the ordinary technic which he must use, but, so long as no two cases are exactly alike, he not only cannot know before the operation, but often he cannot know during the progress of his operation what variation in the distribution of the primary disease nor what association of other important diseases may be present in this particular patient. This being true, he cannot always vary his technic to suit the patient before him. His judgment at the operating table, quite as much as his judgment in diagnosis, is ripened more by his errors than by his successes, providing he is willing and anxious to study his errors post-mortem in detail, unpleasant though it may be.

Shall the surgeon perform his own post-mortems? Where this is possible, it may be a desirable practice. As a general rule, it is not convenient or economical. It is most desirable, however, for the surgeon to be present at the necropsy. In this way he gets a truer knowledge of the pathologic lesions in their relationship to each other than he possibly can in any other way. There is sometimes a tendency on the part of the surgeon who has not seen a necropsy on one of his patients to think that many of the essential findings of the pathologist may be explained as merely " terminal conditions ". Sometimes we hear the expression " dead house pathology " used almost as a term of opprobrium or at least as casting a doubt on the significance of lesions found at the post-mortem table. It is true that there are terminal conditions whose advent could not have been foreseen before the operation or perhaps even known post-operatively and ante-mortem. These conditions, however, are relatively few and insignificant compared with those lesions, such for example as coronary sclerosis or advanced chronic nephritis, which are not terminal although they may be terminative, and which might well have been found pre-operatively.

Another consideration of great importance must always be weighed against that of the surgeon's presence at the necropsy, namely, the desirability of making the examination as soon as possible after death; first, because of the better preservation of the body, and second, for the convenience of the undertaker and, through him, of the relatives. The examination of a body two

hours after death offers opportunity for judging the relative importance of lesions that in many instances is very superior to that afforded even with the best of preservation twenty-four hours after death. When permission is secured immediately after death and the necropsy performed at once, the tissues are not only in a better state of preservation, but embalming may be carried on to better advantage. In hospital practice when post-mortem examinations are conducted in hospital morgues, it is usually easy for the surgeon to be present at the necropsy at least for a short time after the body is opened.

But in all cases in which more than one physician has seen the patient before death or in which a pathologist who has also not been the examining or operating surgeon is concerned, there is nothing which can take the place of the clinico-pathologic conference. This should be held after the tissues have been prepared and examined microscopically. It should be held as soon thereafter as possible. All the physicians who have known anything of the case should be present. In hospitals where numerous necropsies are made, a clinico-pathologic conference should be held at least once a week. All physicians on the staff should be present. Meetings should not be open to visitors; otherwise the members of the staff will not speak with that frankness which is desirable. A very satisfactory way is to present by means of lantern slides a brief abstract of the history of the case, including the surgeon's procedures, if any, and a summary of the pathologic findings. Following this should be a demonstration of the gross specimens, and when the facilities are available, a direct projection with the microscope of the microscopic slides. These are much more satisfactory than lantern slides made from photomicrographs. This method with some modifications has been in use weekly in the Mayo Clinic for the last twelve years. It is always the best attended meeting we hold. I think all the members of the staff agree that it is much the most valuable professional meeting that we hold. I am convinced that such meetings are the best single criterion of service both medical and surgical that exists in any hospital or clinic. By them, each physician and surgeon in the hospital not only has an opportunity to profit by his own errors of commission and omission in diagnosis and treatment, but also to profit by those of his hospital associates and by their friendly suggestions. Surely, one evening a week is not too much for the staff of a hospital to set aside for this most valuable opportunity for improving their judgment in diagnosis and treatment.

We sometimes hear expressed the opinion that opportunities for research on necropsy material are few; that the subject has been exhausted; that everything is known which can be learned from the study of the dead body. This comes from the fact that many very important things have been determined; in fact almost all the fundamental things that we now know concerning the inception and progress of disease have been determined, or at least confirmed, in large measure at necropsy. But on many of the great problems of disease whose solution will, I believe, come through necropsy study, we are in about the same position as we are in cancer research. A host of observers,

many of them very competent, have cleared away the underbrush, ascended the foothills, and come to the base of a cliff, the ascent of which for years has baffled all effort. This does not mean, however, that someone will not "either find a way or make one" over this difficulty. It is probably true that research on necropsy material is not likely to be fruitful of anything very important if done only by the casual investigator who has limited material and conducts his investigation merely to fill in time. For this reason the control of the necropsy research material in a hospital it seems to me, should rest with the pathologist, who, of course, should work in close coöperation with the clinicians of the institution. I verily believe that if surgery is to regain again its momentum of progress which it had until about ten years ago, and which it seems to me has been steadily declining since, it will need not only to make a deeper study of disturbed function through clinical laboratory methods, and of the microscopic beginnings of disease by material from the biopsy, but also much more carefully and much more thoroughly to study the symbiosis of diseases and their bearings on each other, a study which can be made with greatest advantage by careful, scientific examination of the bodies of the dead. American medicine, and especially American surgery, have had a meteoric rise, owing in large measure to the readiness with which the American mind grasps new truths and daringly applies them in new forms of treatment. But unless the American surgeon of the future studies his errors at the necropsy table more consistently, more conscientiously, and more intelligently, his immediate death rate is not going to be materially lowered, his brilliant immediate successes will not be less frequently followed by later failures, and his ability to extend the field of successful operative procedure will be lessened as he himself becomes more and more a mere technician and less and less a student of pathology.

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TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY

Stated Meeting Held December 10, 1924

The President, Dr. Eugene H. Pool, in the Chair

OSTEITIS CYSTICA FIBROSA

Dr. Morris K. Smith presented a woman, eighteen years of age, who first fractured the upper end of her right femur when eight years old, falling down while walking, without especial trauma. Two years later she fell down stairs and again broke the bone in the same region. This time she was treated by an open operation. The report of a specimen removed was recorded as "necrotic bone with fibrosis of the marrow space." Three months after discharge from hospital, she slipped while crossing tracks and a third time fractured the femur in the same area. At this time she came under the reporter's care at St. Luke's Hospital. She was then eleven years old. There was about six centimetres shortening of the right leg. The X-ray report by Doctor Le Wald was as follows: "A most unusual appearance of the right side. The femur shows a fracture through a deformed shaft and neck. There is marked bowing, producing coxa vara-like appearance. The bone is thickened about the shaft and neck. There is a rarefied area in which a metallic suture lies." The patient was put up in plaster and discharged after four months with a brace.

Fig. 1.—M. P., age nineteen, osteitis cystica fibrosa. Three pathological fractures, the last seven and one-half years ago. Metallic suture remains from operation after second fracture.

She was not seen by me again until a few weeks ago, seven and one-half years later. She is now nineteen years of age. There have been no fractures in the interim. The outward bow of the right femur is very marked. There is

eleven centimetres shortening of the right lower extremity, eight of which is in the thigh and three in the leg. There is hyperextension at the knee. Motion of the hip is slightly restricted. X-ray (Fig. 1) shows an abnormal appearance of the femur, outward bowing and thickening with rarefied areas. In the opinion of the radiologist, Dr. Percy Brown, the condition is osteitis cystica fibrosa. Other bones were filmed, including opposite femur, skull, shoulder, girdle, wrists and hands. The only lesions found were a rarefied area in the ileum adjacent to the involved femur and in a rib. As the patient has now attained her growth, she also represents an end-result in this condition.

ULNAR NERVE INJURY ATTENDING INJURY AT WRIST

Doctor Smith presented a young woman, who while doing resistive exercises with the left hand bent back on February 6, 1924, felt a tearing pain in the wrist and became disabled. Examination revealed hardly any swelling and no ecchymoses. The wrist was sensitive to palpation, but the definite localized tenderness of fracture was absent. The X-ray was negative for fracture or dislocation. On account of the patient's complaint of pain, however, an anterior moulded splint was applied to the forearm and hand. Some days later it was noted that the patient complained of much more pain than the objective signs would seem to indicate. Removal of the splint and circular strapping increased the distress. Nerve injury was now suggested by the patient's remarking some numbness in the inner two fingers. Examination of sensibility disclosed hyperæsthesia in the region of the head of the ulna and loss of sensation on the ulna distribution of the fingers and distal part of the palm. The interossei muscles functioned, although not vigorously. The diagnosis of ulna nerve injury was confirmed by Dr. Irving H. Pardee, under whose direction the treatment was continued of splinting the forearm, hand and fingers and physiotherapy.

Pain, sufficient to cause sleeplessness at night, was a constant complaint and only began to ameliorate after the first month. The splint was worn about six weeks. A little over two months after the injury, when last seen by the reporter, she was improving steadily and the pain had cleared up. At this time she could recognize a pin-prick all over the ulnar area, although it was still a little numb. The intrinsic muscles of the hand were never paralyzed, although there was some atrophy of the thenar and hypothenar eminences.

UNRECOGNIZED FRACTURE OF THE CERVICAL SPINE WITH LATE CORD SYMPTOMS

Doctor Smith presented a man, thirty-nine years of age, who was admitted to St. Luke's Hospital on April 10, 1924. Six weeks before, he fell head first off a subway platform, injuring his right hip, left shoulder, scalp, neck and fracturing three ribs.

When first seen by the reporter about five weeks after injury, his chief complaint was pain and stiffness in the neck. There was swelling and tenderness over the upper cervical region and motion of the head was painful and restricted. The next heard of him was that he had become worse and developed weakness in the right arm. He was then admitted to the hospital. The X-ray revealed a fracture of the anterior part of the body of the second cervical vertebra with some anterior displacement of this vertebra on the third, and a fracture of the spinous process of the fourth cervical. Traction was put on the neck by means of a head harness leading to a pulley and weight at the head of the bed.

The neurological examination two days after admission by Doctor Pardee

was as follows: "Some weakness of right arm, weak grip. Right wrist jerk absent, left present. Biceps active and equal. Knee jerks, right greater than left, both active. Ankle jerks, right ankle clonus, left tendency to clonus. There is less acute appreciation of sensation over the body below face anteriorly than above. No loss of deep sensibility. Impression: There is pressure upon the spinal cord more on the right side and probably above C4 level. Harness prevents accurate sensory examination."

The weakness which involved both arm and leg cleared promptly. Some three weeks after his first examination Doctor Pardee noted: "Pressure upon the spinal cord has materially diminished, hyperflexion at ankles being only definite sign left." The patient was discharged from the hospital two months after admission wearing a brace.

Dr. Royal Whitman said that fracture of the spine without cord symptoms was not uncommon. The site of election was in the lower dorsal region. He had, however, seen several cases of fracture in the cervical region in which the only symptoms were that of stiff neck with slight deviation.

Dr. Alfred S. Taylor referred to the case of fracture of the cervical spine which he presented before the Society, April 12, 1922. In his case, however, there were cord symptoms; there was total loss of function lasting over twelve hours. The fracture was reduced by manipulation and the woman put up in a plaster case, for which a leather collar was later substituted. The patient can now get about and do her work very well, although she has a stiff spastic leg. The left upper extremity is also somewhat rigid, but is improving steadily. She has very good power and complete range of motion in the right leg and right arm. What interested the speaker particularly in Doctor Smith's case was that four of the vertebræ showed some crushing damage and the last radiograph shows well-developed bridging of bone between the anterior margins. Where one has such spread of damage over a wide segment of the spine, there is less likelihood of injury to the cord than where there is damage between two adjoining vertebræ with sharp angulation. In the upper part of the cervical canal the room is so great that here one is less apt to get traumatism to the cord unless there is very marked distortion of the bony contour.

FRACTURE DISLOCATION OF THE CARPUS

Doctor Smith presented a man, aged thirty years, who was admitted to St. Luke's Hospital, March 31, 1921. Four days previously, he fell two stories into a paved court-yard, suffering concussion of the brain, fracture of the left olecranon process, fracture of the lower extremity of the left radius and an injury to the right wrist, which is the point of interest in this presentation. At first it was thought that he had merely a fracture of the scaphoid of the right wrist, on account of the difficulty of getting satisfactory X-rays in his serious condition. Later röntgenograms demonstrated not only fracture of the scaphoid, but an anterior dislocation of the distal row of carpal bones upon the proximal and fracture of the os magnum. Reduction was not attempted. After discharge from the hospital at the end of two weeks, the patient was referred to the Out-patient Department, where he had a course of massage.

A note of September 6, five months after injury, states that there is no

flexion at the wrist and about 10 to 15 degrees extension. The patient had already two weeks before resumed his occupation as a masseur, which he has continued to follow without complaint. It is noteworthy the excellent use in an occupation, muscularly taxing, which this man enjoys after so severe an uncorrected injury.

Dr. Royal Whitman remarked that this case illustrates the difficulty of estimating the degree of disability from injuries of this class. Actually the range of motion at the wrist is diminished to less than half the normal—yet it is to the man's interest as a professional masseur to prove himself equal to the normal standard. His estimation of his injury would be probably quite different if he were entitled to a pension or to compensation.

ACUTE PERFORATION OF THE DUODENUM. SUTURE ON HEINEKE-MIKULICZ PRINCIPLE

Dr. Charles L. Gibson presented a man, aged thirty years, who was operated on for acute duodenal perforation at the New York Hospital, September 27, 1924. The perforation was on the anterior surface of the duodenum, one-fourth inch in diameter, and one inch distant from the pyloric vein. It was sutured by two rows of catgut on the Heineke-Mikulicz plan, that is vertical to the long axis of the gut. The lumen of the gut is plainly not interfered with by this form of suture. Recovery was absolutely uneventful. He was allowed up on the twelfth post-operative day. Fluoroscopy by Dr. Arthur L. Holland about six weeks after operation shows absolutely no stasis or constriction. Patient reports himself at present, December 10, as enjoying the best health he has ever had and has gained thirty pounds since operation.

Doctor Gibson said that he had adopted this plan of suture which minimizes the amount of constriction resulting from the closure for some little time. He thought it must have a favorable influence as the post-operative complaints or the necessities for intervention have been distinctly less than after the operations when, in common with most operators, he was using chiefly circular purse-string sutures.

Dr. Edward W. Peterson said that in selected cases of acute perforation of the duodenum, a principle similar to, but more radical than the Heineke-Mikulicz operation, could be employed, namely the Horsley pyloroplasty. He knew of six instances in which this procedure had been used with highly satisfactory results in each case.

THE TONGUE DEPRESSOR GASTRO-ENTEROSTOMY CLAMP

Doctor Gibson recalled the attention of the Society to a procedure described by him in the Annals of Surgery of May, 1915, *viz.*, the use of common wooden tongue depressors cut in longitudinal halves as a clamp in performing gastro-enterostomy for which use they serve admirably. He had used them nearly to the exclusion of any other form of clamp for anastomosis for about ten years. An ordinary, fairly strong, artery forcep serves well for holding the clamp, although originally, he had recommended rubber bands.

His purpose in re-presenting this method was to call attention to the fact

that at no time, and particularly since he had been using this clamp, had he had the unfortunate experience of a gastro-jejunal ulcer which seems to occur sooner or later in the practise of everybody doing gastro-intestinal surgery.

As these clamps produce no trauma on the viscus, he wondered whether this fact might not have something to do with the immunity. In addition they have the advantage of not being clumsy. He always releases any form of clamp after the suture of the posterior wall, *i.e.*, the first three rows of suture, had been completed, and with this little clamp there is no clumsy apparatus to disengage—simply a releasing of the two artery forceps.

DR. EUGENE H. POOL said he had seen Doctor Gibson use this clamp repeatedly and in his hands it works very nicely. It did not appeal to the speaker more than the Roosevelt clamp, yet it is perhaps more delicate.

VALVULAR CÆCOSTOMY FOR COLITIS

DR. CHARLES L. GIBSON presented a man, aged forty-four years, who entered New York Hospital for dysentery, March 4, 1924. He had had some years before an appendectomy followed by post-operative adhesions for which an operation was done by the reporter, January 12, 1924, and from which he made a good recovery. He was now suffering from a typical dysentery, fifteen or more bowel movements a day, with severe tenesmus. Stools often contain blood; probably a recurrence of a trouble contracted in the tropics years ago.

He remained under observation on the medical service for about six weeks without improvement. April 23, 1924, Doctor Gibson performed a valvular cæcostomy, infolding a tube of No. 26 French calibre. The man responded rapidly to treatment by the irrigations which were given for some time to him as an out-patient. Irrigation fluids varied, being mostly saline; but solutions of quinine (1/2000 quinine hydrochloride solution) and ichthyol (one dram to two quarts of water) were also used. The fistula was allowed to close six months after the operation. He is now entirely well, having one bowel movement daily.

DOCTOR GIBSON said that this operation was devised first by him many years ago, the first operation having been done by Dr. P. R. Bolton at his suggestion. It was published in the *Medical Record* of March 16, 1901. The original paper was read in Boston, March 5, 1902; but it was not published in the *Boston Medical and Surgical Journal* until September of that year. Before this paper was published Doctor Weir, who had been told of Doctor Gibson's method, did one of these operations; but had a mishap in that he pulled out the catheter after having sewn it in place, and there was soiling, and the patient made a poor recovery. He had a second case the same afternoon, and the thought occurred to him to use the appendix instead of making a cæcostomy. As his communication was published promptly a long time before that of Doctor Gibson's appeared, the term appendicostomy for colitis became definitely established.

DOCTOR GIBSON called attention to the fact that up to the time he proposed this operation, the surgical treatment of colitis was of little or no value for the colostomies that were performed were attended with many disadvan-

tages and often were performed on the left side of the colon, where they could do absolutely no good. The valvular cæcostomy with a fairly good-sized tube, as he employed it, has an advantage over its proposed substitute, the appendix. The hole is a good deal larger, which is a greater advantage and closes spontaneously so soon as the passage of the catheter is discontinued, while the appendix has to be removed by a second operation. It is absolutely tight and the patient requires no dressing and can carry out the treatment as an ambulant patient.

The value of the various antiseptics or stimulants used as an irrigating fluid is not always clear. He had relied largely on the use of simple saline solutions, being perfectly bland, and allowing it to run right through the bowel; that is, a catheter or small rectal speculum is inserted in the anus and the fluid allowed to run right out as one would flush out a pipe.

PLASTIC FOR HYPERTROPHY OF THE BREAST

Dr. Albert E. Sellenings read a paper with the above title.

Dr. Walton Martin said that it seemed to him that a distinction should be made between moderate and extreme degrees of hypertrophy of the breast. In the latter, it would not seem that plastic procedures were advisable, for one cannot always distinguish between those due to multiple adenomata and those merely enlarged. He remembered a negro girl operated on some years ago at the Roosevelt Hospital of whom it was assumed that the breast enlargement was a simple hypertrophy. Both breasts were amputated and were found to be made up of packed masses of adenomata. It would be better to do an amputation in these cases.

Dr. Hugh Auchincloss said he remembered very well the cases cited by Doctor Martin; they were still being used as examples of the two types he speaks of for student instruction at the College of Physicians and Surgeons. Indeed, the encapsulated tumors may be very deceptive in their resemblance to the diffuse type of hypertrophy. One case he had watched for many years had so large and painful left breast that she had rigged for herself a sort of sling for its support. Just before every period she had great pain in it and it enlarged perceptibly with marked increase in venous engorgement. After observing it for over a year, and after many forms of treatment had been suggested and tried, an operation was done with the understanding that the breast might have to be removed. A Thomas type of incision was made, a large, encapsulated tumor was found and readily removed, with the result that the breast has now returned to a normal size and there have been no symptoms referable to it.

Unilateral hypertrophies are not so uncommon. Sometimes it is difficult to say whether the lesion is an hypertrophy on one side, or a lack of development on the smaller side. Recently he had seen a young girl with a large right breast, but a very small, though perfectly formed, left breast, situated at a much higher level, but beneath it a complete absence of the abdominal and sternal portions of the pectoralis major muscle.

In one case, of unilateral hypertrophy, he had removed a sector-shaped piece of the breast. This gave some elevation and reduced the size somewhat, but not enough, and he did not feel it to be a success.

In another case, of bilateral hypertrophy in a young woman whose life since early childhood had been spent in education for the stage, but whose breasts had become so weighty and painful that she was all but incapacitated for carrying on her life work, he had tried a different procedure after explaining the possibility, in event of lactation, that there might be some functional loss.

Both breasts were turned over on the chest wall, by means of a Thomas or Warren, infra and paramammary incision, so that their posterior aspect looked uppermost on the table. About three-quarters of the posterior part of both of the breasts were removed and an ellipse of skin removed from the lower part just above the inframammary incision.

This gave a far better and symmetrical result much to the gratification of the patient, though a keloidal portion of the scar on the outer side had to be removed subsequently. On removing the weighty bulk of breast tissue, the stretched skin can be counted on to undergo considerable contraction, thus avoiding the slack and loosened appearance one might expect, especially when only the posterior part of the mammary tissue has been removed and nothing done to interfere with the breast tissue in immediate contiguity to the skin.

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY
Stated Meeting Held January 5, 1925
The President, Dr. Edward B. Hodge, in the Chair

BILATERAL CONGENITAL EXTERNAL DISLOCATION OF PATELLA

Dr. B. Franklin Busby presented a girl, ten years of age, in whom from her first efforts at walking it had been noticed that frequently her knees would give way and she would fall forward. This condition of affairs continued until six months ago, when the child began to get fat, when the

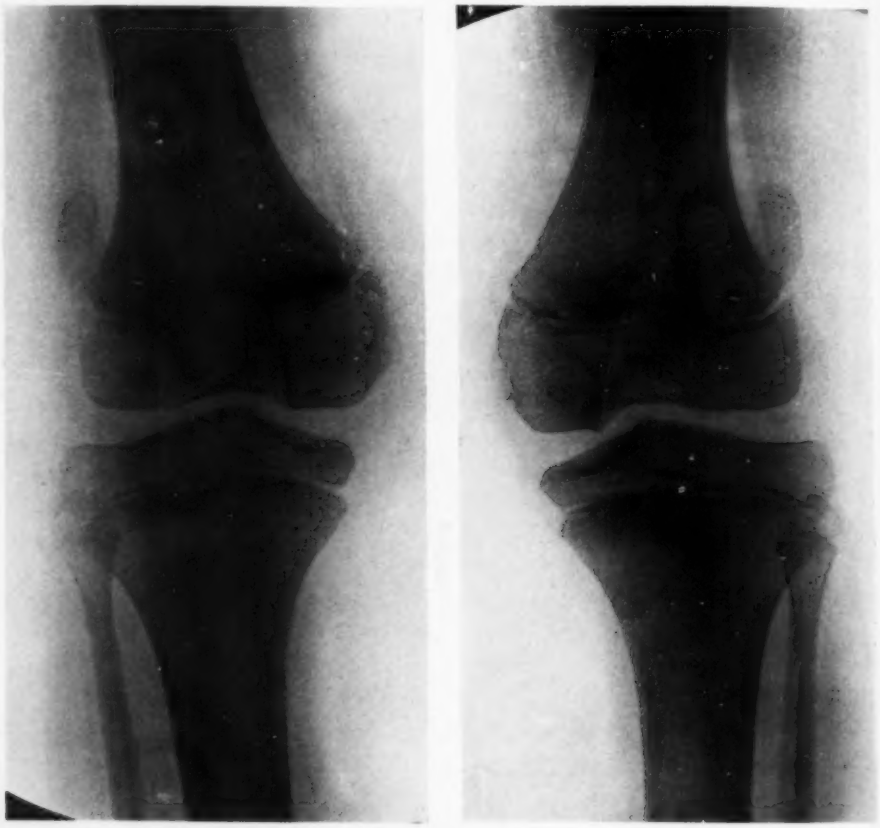

Fig. 1.—Bilateral congenital external dislocation of patella.

falls became much more frequent. For the past month the child had to be supported when walking, otherwise she would be unable to walk at all because of the collapse forward of both knees. The child was short and fat. Her general physical examination revealed nothing worthy of note except in the lower extremities. She had bilateral knock-knee of 25° on each side,

which on flexion appeared greater. She had bilateral flat feet of moderate degree. There was apparently full power in the quadriceps extensor and all other thigh muscles, but she was unable actively to extend either knee against gravity beyond 135°. Passive extension of the right knee was full, but the left could not be extended beyond 160°. Active and passive flexion was normal. When standing the knees were slightly flexed and one knee would be propped against the other for support.

The patellæ were small, about the size of a quarter dollar, and were palpable on the lateral side of each knee (Fig. 1), and in the sagittal rather than the coronal plane of the body. They were about 2 cm. above the normal position in relation to the femoral condyles. The patellar and quadriceps tendons were of normal size apparently, and the former inserted normally into the tibial spines. The femoral intercondylar notch was visible and palpable with the knee flexed. Manually the patellæ could be held nearly in the midline of the knee, but were above the normal position with relation to the femoral condyles.

May 12, 1924, under gas and ether anæsthesia, the following procedure was carried out on the left side: Under tourniquet hæmostasis a longitudinal incision was made over the middle of the knee and lower half of the thigh. The patella, quadriceps tendon and patellar tendon were mobilized. A strip of fascia lata 10 cm. long and 2.5 cm. wide was removed and folded longitudinally. This was laced subperiosteally through transverse slits, four in number, on the anterior surface of the patella and the upper inner aspect of the tibia, after the method described by Soutter in the *Journal of the A. M. A.*, in April, 1924. A supracondylar osteotomy was then done through the same incision and the knock-knee was overcorrected, and at the same time the lower fragment of the femur was rotated so that the external condyle was rendered more prominent and the patient's toes pointed inward about 45°. The fascial transplant was then made taut, which brought the patella almost in the midline of the knee. The transplant was then sutured at both insertions and lapped and resutured. The defect in the fascia was obliterated, the skin wound closed without drainage, and a plaster case applied.

Two weeks later, May 26, 1924, the same procedure was carried out on the right leg. However, at the site of the application of the tourniquet on this side a hæmatoma developed which became infected a week after operation. This as well as the upper 7 cm. of the wound was opened and a large amount of sanguino-purulent material was evacuated. Drainage was inserted and Dakin treatment instituted. The infection cleared up within two weeks and fortunately the process did not extend to nor involve the structures about the knee.

New cases were applied July 3, 1924. The wounds were in good condition and union was firm in the femora. The patellæ were on the anterior surface of the knees but slightly external and above the normal position. Considerable atrophy of both quadriceps muscles was present at this time.

New cases were applied August 20, 1924, and the patient was instructed to walk in these cases with the aid of crutches, which she did very well. Both cases were removed September 17, 1924, after which walking was continued with crutches and physiotherapy begun. X-ray at this time shows firm union of the femora with the patellæ displaced upward and slightly laterally.

On October 15, 1924, full flexion of both knees was present and painless and the patient could extend, and hold fully extended, the right leg against gravity but not the left one. She could walk well without crutch support but with moderate intoeing.

Within the past month the left knee has slightly collapsed on three occasions and at the present time passive extension is possible, on the left side, to only 165° and a lateral view X-ray taken on December 17, 1924, shows an exaggerated forward convexity of the lower femur. This deformity he proposed to correct later by a supracondylar osteotomy, after which he hoped that the tendency to collapse of this knee will be overcome. At the present time the intoeing which resulted from the rotation of the lower fragments of the femora has practically disappeared and the child gets around in comfort and without falling.

The mother says that the father of this child had the same kind of deformity of the knees and the same weakness, but that he never had any attempt made to relieve the condition.

DR. HUBLEY R. OWEN mentioned a case operated upon by him at the Orthopædic Hospital some years ago. The difference was that this case was not one of habitual dislocation as was Doctor Busby's, but was a recurring dislocation which could be reduced. He did not do an extensive operation but simply fastened half of the ligamentum patellæ to the tibia. His patient was seen one year ago when the result was still good.

RELATIVE USES OF CHOLECYSTECTOMY AND CHOLECYSTOSTOMY

DR. JOHN B. DEAVER read a paper with the above title, for which see page 761.

DR. JOSHUA E. SWEET said that he believed he was responsible for the statement which Doctor Deaver quoted only in part in his paper, *i.e.*, that whatever under normal conditions goes into the gall-bladder through the cystic duct never passes out through the cystic duct; he was still of that opinion. Otherwise he agreed with what Doctor Deaver has said. It seemed to him that there is no question but that the removal of the infected focus is indicated. The only problem existing now is not cholecystectomy *vs.* cholecystostomy, but how is the surgeon to recognize whether the physician has waited too long so that when the patient comes to the surgeon he is suffering from a condition Doctor Deaver has termed as "what not?"

DR. A. P. C. ASHHURST said that in one matter he did not agree with Doctor Deaver, a matter in which he seems to be scarcely consistent. The speaker much preferred the operation of cholecysto-gastrostomy to that of cholecysto-duodenostomy, because it is much easier to do and therefore much safer. Moreover, it gives quite as good results. Doctor Deaver's objection to it is that the Almighty made the duodenum and not the stomach the natural drainage place of the bile. Yet it is well known that for many years Doctor Deaver preferred gastrojejunostomy to Finney's method of pyloroplasty. Has he utterly and permanently abandoned the former operation?

DR. JOHN H. JOPSON said that in going over his own statistics for the last few years, he finds that he is leaving unremoved an exceedingly small percentage of gall-bladders. He believed also that statistics from the various clinics all over the world show that the number of cases of recurrence of symptoms after cholecystostomy is much greater than after cholecystectomy.

The last series he went over was the report from the Johns Hopkins Hospital which showed that the recurrence of symptoms was found oftener in cases of drainage than after cholecystectomy. If the surgeon can satisfy himself that his own case mortality is not increased by cholecystectomy, then he believed he will be doing best by the patient in the long run to remove the gall-bladder.

As to internal drainage of which he spoke, as far as any function of the gall-bladder as an absorbing or concentrating organ is concerned, it is done away with by the establishment of a large stoma between it and the gastro-intestinal tract.

As to the injury of the common duct, it seems that everybody has it happen occasionally—even the most expert. In a case operated upon recently in which a stricture of the common duct followed accidental wounding of the duct during cholecystectomy at the hands of another surgeon, he practised the method of anastomosis recommended by Doctor McArthur and the result promises to be satisfactory. He believed that in most of these cases McArthur's method is the best.

Dr. Charles Nassau did not know how a condition which is suitable for internal drainage can be diagnosed accurately. One would have to be on his guard, for instance, not to make an internal drainage in a primary carcinoma of the gall-bladder. He remembered a case in which he removed the gall-bladder for an apparently mild gall-stone condition, where the laboratory report showed a primary carcinoma of the gall-bladder. The patient recovered from the operation, but two years later she began to die of cancer. Recently he had a second case in which there was not the slightest suspicion of anything but a cholecystitis where the laboratory showed carcinoma of the gall-bladder. Whether this patient is going to escape a recurrence is problematical. He had had no experience with so-called internal drainage cases except in malignant disease which involved the common duct. In malignant obstruction of the terminal portion of the common duct, the last months of the patient's life can be rendered so comfortable by a cholecystoduodenostomy that the risk is more than justified. In the cases where the patient is badly jaundiced, the mortality will be higher than it is in ordinary gall-bladder surgery. A cholecystectomy is the operation of choice except in those patients who suffer from a very acute empyema of the gall-bladder, where the walls of the gall-bladder are very thick, friable and hemorrhagic; these gall-bladders should never be removed at first operation. It is far better to do a second operation on these patients and have them live than expose them to unjustifiable risk by doing a cholecystectomy.

Dr. Harry C. Deaver said that in long-standing gall-bladder disease, with disturbed liver function, it has been his rule not to operate too soon after the patient enters the hospital, for in advanced gall-bladder disease the liver, kidneys and myocardium suffer as well. Pre-operative treatment is most essential, which means rest in bed, a mild diet, with plenty of water.

In the border-line cases, it is a difficult question sometimes to decide

whether to remove or drain the gall-bladder. In his opinion, one must rely upon the clinical symptoms, especially where they overshadow the condition of the gall-bladder. Under these conditions he always removes the gall-bladder. In his own cases he has had fewer recurrences of diseases of the biliary tract after cholecystectomy than after cholecystostomy.

ENTERO-MESENTERIC CYSTS

Dr. Thomas A. Shallow read a paper with the above title, for which see page 795.

Dr. Harry C. Deaver said that he reported a case of mesenteric cyst in 1902. This is the only case he had ever seen. It sprang from the wall of the small intestine and extended between the layers of the mesentery. It was diagnosed as a case of intestinal obstruction. The patient was ill only a few hours. He operated immediately before any damage was done to the bowel, doing a resection and an end-to-end anastomosis, with recovery of the patient. These cases are extremely rare and their symptoms usually point to some form of obstruction.

KIENBÖCH'S DISEASE OF THE SEMILUNAR BONE

Dr. Ralph Goldsmith (by invitation) reported three cases of this condition, illustrated by lantern slides. For his remarks in this presentation, see page 857.

CORRESPONDENCE

ACTINOMYCOSIS OF THE TONGUE

EDITOR ANNALS OF SURGERY:

Sir:

Although the tongue tissue, on account of the small amount of its connective tissue and its thick epithelial covering, is resistant to the actinomycotic fungus, such implantation occasionally occurs. To date there have been forty cases reported, including my own. New and Figi observed three cases and collected thirty-five from the literature. The patient usually presents himself because of a swelling or well localized nodule in the tongue, usually situated well in the anterior portion. The salient points in diagnosis are a history of chewing grain beards or grasses or caring for animals with the disease, a chronic course, and lack of general lymphatic involvement. Incision of the nodule and recognition of the sulphur bodies and the ray fungus under the microscope verify the diagnosis.

A record of the following case is the object of this communication: A farmer, aged thirty-five years, was admitted to the Jackson Clinic, June 18, 1924; five months previously he had first noticed a soreness in the tongue and a nodular swelling on its dorsum at the junction of the anterior and middle thirds; one month later the lump ruptured and he spat out a dram of foul smelling material. After a short period of relief the induration was again noticed, accompanied with difficulty in manipulating food in the mouth. From this time on the nodule continued to increase in size, rupturing spontaneously every three or four weeks. June 19, the nodule was incised with evacuation of foul, bloody pus containing sulphur bodies in which, under the microscope, ray fungi were seen. Potassium iodide, grains 15, and copper sulphate ¼ grain, were given three times daily. Locally the wound was treated with copper sulphate, silver nitrate solution, and the silver caustic bead. In the presence of considerable induration the use of radium tends to soften the nodule and facilitates the elaboration of the potassium iodide. In four weeks the nodule had entirely disappeared, and at the last examination, five months later, had not returned.

Actinomycosis occurs with sufficient frequency in agricultural and dairying localities to warrant our being continually on the watch for it.

R. A. BARLOW, M.D.,
Madison, Wisconsin.

COMPLETE POSTERIOR DISLOCATION OF LEFT ANKLE-JOINT

EDITOR ANNALS OF SURGERY:

Sir:

The following record of ankle trauma is submitted for publication because of its infrequent occurrence, the completeness of the posterior dislocation, the slight chip-fracture of the tibia and the normal motions and full functional

results obtained following reduction. The patient was a well-nourished male negro, age eighteen years, who was seen 6.30 P.M., March 6, 1924, half hour following injury. He stated that his left foot was caught between two ore cars and his body was thrown sharply backward, striking the back car and then falling on the ground to the left of the cars.

Physical and radiograph examination showed a marked posterior dislo-

FIG. 1.—Röntgenogram. Lateral view, showing posterior dislocation of left ankle.

cation of the left ankle-joint (Fig. 1), with a slight chip fracture on the posterior inferior surface of the left tibia. There were multiple abrasions around the left ankle and knee with a slight laceration over the right knee. Under ether reduction of the posterior dislocation of the ankle was accomplished by the routine method for such dislocations without very much difficulty. A posterior plaster splint was applied immediately extending from the

toes to the upper third of the leg, including the whole posterior half of the left foot, ankle and leg, which was held in place with circular strips of adhesive and a plaster-of-Paris case. Radiant light was used three times a day, commencing immediately. Active motion was commenced on the eighth day. Diathermy was given daily after the fourteenth day and the case removed entirely on the twenty-fourth day. Weight-bearing was not allowed for six weeks following injury. Crutches were discontinued eight weeks after injury. The patient returned to his original work at time of injury, twelve weeks after accident, without any permanent disability with every motion in the ankle normal.

FIG. 2.—Showing extent of flexion and extension of left ankle eleven weeks after injury.

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H. EARLE CONWELL, M.D.,
Fairfield, Ala.

LIPOMA OF THE INGUINAL CANAL

EDITOR ANNALS OF SURGERY:

Sir:

The following case was reported at the meeting of the Southern Surgical Association in December last in discussing Doctor Horsley's paper on New Growths in the Regions of the Inguinal and Femoral Canals, which paper was published in the January, 1925, issue of the ANNALS OF SURGERY. I am reporting this single case that it may be put on record.

A man sixty years old, case number 24-4768, was operated upon December 5, 1924, in the Memorial Hospital for what appeared upon examination to be a large size right

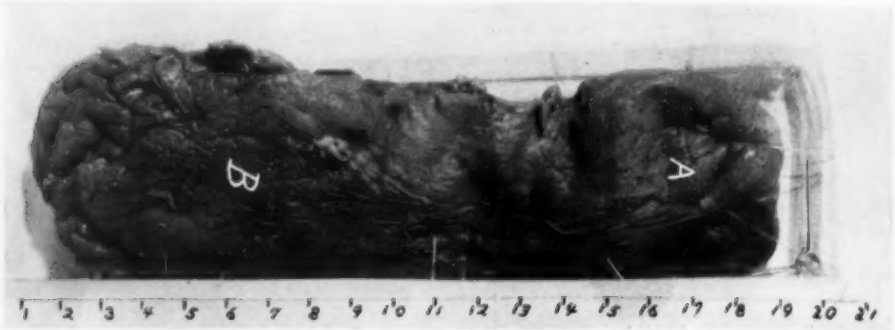

FIG. 1.—Fatty tumor of the inguinal canal. A. Portion below external ring. B. Portion high in inguinal canal. Note groove indicating location of external ring. The mass of fat was seven inches long, three inches wide at the upper portion and two inches wide at the lower portion.

inguinal hernia, which he had noticed for many years but which during the past two years had increased in size and become annoying.

Upon examination in the standing posture there was a tumor in the groin reaching well down to the upper part of the scrotum. Upon lying down the swelling disappeared from view; upon coughing or straining it immediately reappeared with an impulse, and had typical signs of an ordinary indirect inguinal hernia.

Operation was advised and we operated under novocain regional anæsthesia block described by Labat.

After incising the skin and the aponeurosis of the external oblique, a large mass of fat was immediately seen in the inguinal canal at the outer side of the spermatic cord. The spermatic cord was quite normal in every respect. After opening the peritoneal cavity about an inch above the internal ring no hernia could be discovered. The peritoneum in this area was perfectly normal. We were dealing with a large lipoma having its origin in the retro-peritoneal tissues and extending downward into the canal two or three inches beyond the external ring. The tumor was not adherent at any place, was easily enucleated from its bed without dividing any vessels. There was no real capsule enclosing the tumor, merely a thin film of loose areolar tissue. The tumor measured seven inches in length, three inches in breadth at that portion located high in the canal, and two inches in breadth at the distal portion protruding beyond the external ring.

The case is one of true lipoma originating in the retroperitoneal fat. There was no excessive fat in the spermatic cord and there was no hernia of any kind. It could in no way be confounded with lipomata of the cord or with fatty hernia. I have never met the condition before in operating upon more than a thousand cases of hernia and two or three hundred other conditions resembling hernia in this area.

G. PAUL LAROQUE, M.D., *Richmond, Va.*

DESCENT OF THE GLOBUS MAJOR WITH RETENTION OF TESTIS IN THE ABDOMINAL CAVITY

EDITOR ANNALS OF SURGERY:

Sir:

Abnormalities in the descent of the testicles have given rise to much discussion as to the theories of faulty descent, and also to a large mass of literature as to the various locations in which the incompletely undescended testis may be retained.

The following case is reported simply as a matter of anatomical interest, and from a review of the literature, I have been unable to discover a parallel

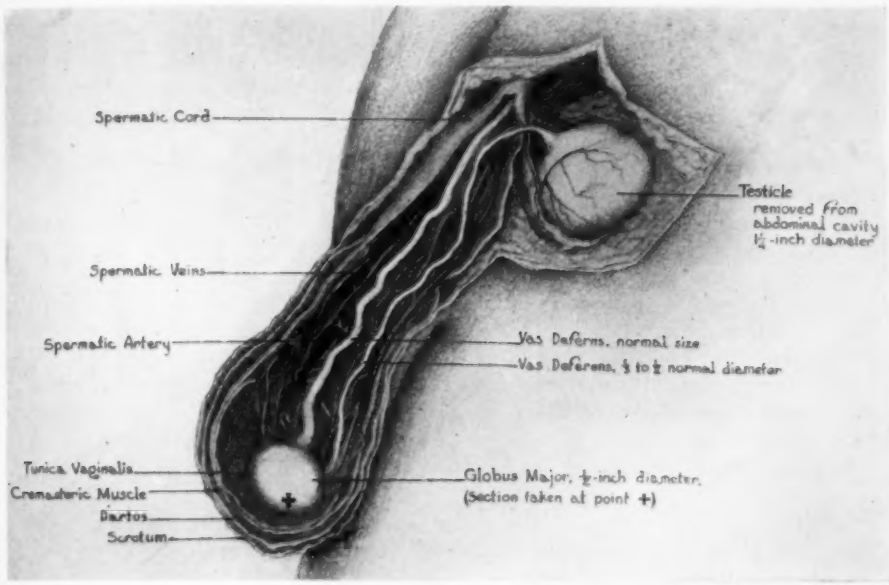

FIG. 1.—Illustration does not show the hernia sac and intra-abdominal testicle in true relation to the internal abdominal ring, as was found at operation. Also that part which is shown in drawing as "vas deferens ⅓ to ½ normal diameter" is described in text as probably unravelled epididymis. The drawing was made rather schematic in order to show the relationship between the parts mentioned in the text.

case, the nearest approach in similarity being a case reported by Spencer,[1] but in his case the testicle was located just within the abdominal ring, whereas the vas deferens had descended and was held at its lowest portion by a band of fibrous tissue, and was then reflected upward as an unravelled epididymis.

A man, K. M. R., aged twenty-eight years, white, was admitted to hospital, May 19, 1923, for operation on left inguinal hernia. General physical examination was negative, except for a moderate-sized indirect left inguinal hernia, and a small atrophic testicle on the left. Laboratory findings were negative. No abnormalities were suspected in this case, and on May 19, 1923, he was operated upon under general anæsthetic.

The findings at operation were as follows: On the left side was a moderate-sized indirect inguinal hernia. The cord was found lying posterior to the sac, which was thin-walled and contained some omentum. There were many adhesions about the cord, from constant wearing of a truss. After the sac had been opened, and while separating the cord from the sac, a mass similar in size and shape to a testicle was found lying

in the abdominal cavity, with pedicle attached to the wall of the sac and contiguous with the covering of the spermatic cord. The mass which escaped from the abdominal cavity had no collecting tubules or apparent epididymis, but simply a small pedicle. It was not clear as to whether or not this mass was a third testicle. In order to identify the mass, it was felt wise to investigate the atrophic testicle in the scrotum, and therefore the vas and cord was followed down and the atrophic testicle delivered and the tunica opened. A normal-sized tortuous vas extended to this mass in the scrotum, apparently to an epididymis, and from the lower pole of what appeared to be an atrophic testicle there was what seemed to be a small vas with its accompanying blood-vessels extending upward in the covering of the cord to the mass which had been delivered from the abdomen, and which resembled a normal-sized testicle without any epididymis (Fig. 1). In view of the fact that this appeared to be a third testicle, a small section was removed from the atrophic mass lying in the scrotum and was sent to the laboratory for diagnosis as to whether or not it was testicular tissue. There were no other abnormal findings. Musculature was good.

The operation itself consisted of a typical herniotomy of a modified Ferguson type. The abdominal tumor and its accompanying vas deferens were freed and placed in the tunica with the smaller mass. Tunica closed with catgut and the hernia operation completed.

The laboratory report on the section taken from the scrotal mass was chronic epididymitis, and in view of this report it was felt necessary to modify the statements which were made at time of operation. The mass in the scrotum, which on clinical diagnosis was thought to be an atrophic testicle, was probably the globus major which had pursued a normal descent, while the testicle itself had remained within the abdominal cavity, and that which appeared to be a vas running from the abdominal mass to the atrophic mass in the scrotum was apparently an unravelled epididymis rather than a vas deferens.

This case is reported simply as a matter of anatomical interest, and as a collection to the mass of literature which has already been written regarding the causes of faulty descent of the testicles.

Approved for publication by the Director, U. S. Veterans Bureau.

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BOOK REVIEWS

PATHOLOGY AND SURGERY OF THE SPLEEN. By LUIGI SILVESTRINI, Chief Surgeon of the City Hospital of Rimini, Italy. L. CAPPELLI, BOLOGNA, 1924.

The author is already well known for a previous work on the subject, "The extirpation of the spleen in cases of pathologic condition of the liver and of the blood," published a few years ago as a thesis for a professorship degree. The present work, which the author modestly calls "An experimental and clinical study," is a large volume of 400 pages, well illustrated by numerous plates from anatomical and pathological preparations and could easily be classed as a complete treatise on the subject.

The book is divided in three parts: The first, dealing with the anatomy and the physiology of the spleen, reviews the general features of the organ, its histogenesis, its anatomical constitution and topographic disposition. And then at length describes the physiological hæmatic function, with special mention of the new studies on endocrin medullary functions, and the hæmopoietic and hæmolytic activity of the organ in the regular exchange of the iron in the organism. His chapter on the digestive function of the spleen is full of very interesting biographic references, as is also the short chapter on the antibacteric and antitoxic function of the same.

The first part ends with an important study on the "Physiopathology of the organ," questioning the problematic necessity of the organ to the regular course of the human life, and pointing out the influence of splenectomy in the function of the bone medulla.

Commenting on the experiences of the different reporters on the consequence of splenectomy in the animal organism, he comes to the conclusion that, the exclusion of the spleen has a tendency in starting an hyperfunctionality of other organs having an analogous function in the human organism, so far as to almost create the supposition that the organ could be reproduced. A supposition not based on any scientific proof.

The second part deals with the "Surgical Splenopathies," a word which has no scientific significance, as there is no boundary line between medical and surgical splenopathies. The word applies to those cases subject to surgical intervention. The "symptomatology, the diagnostic and the general treatment" are diligently and profusely described and illustrated.

In twenty-one chapters the different morbid conditions of the spleen and the various methods of treatment are carefully studied, beginning with the displacements, following with the traumatic lesions, wounds and consecutive hernias, the abscesses, the various kind of cysts, the vascular, the solid and malignant tumors, the primary tuberculosis, the syphilitic splenomegaly, the chronic malarial one, and that of Leishman, the infantile splenomegalic anæmia, and that of Greisinger-Banti, with a description of Banti's disease,

followed by the chronic splenomegalic hæmolytic icterus, the pernicious anæmia, the leucæmic and pseudoleucæmic splenomegaly, the hyperglobulic splenomegaly, and the spleno-thrombotic chronic splenomegaly, the amyloid, the hepatic cirrhosis and the purpura hemorrhagica. Each chapter is full of experimental references and studies on each special morbid subject with biographic records and details on different treatments and cures, which are all collected in the final general conclusions.

The third and last part is entirely devoted to the description and different technics of operations for the various morbid conditions of the spleen.

It goes into the particular details of each method of the already known and familiar surgical terminology, reviewing the various processes of splenectomy of splenorrhaphy, of splenopexy with illustrations, of splenectomy, with a history of the various processes and demonstrations of post-operative courses, of the resection of part and of the entire organ with an exhibition of the different methods, ending with the description of the special processes for the ligature of the splenic vessels.

Each part is supplied with an abundant bibliographic literature which completes the interesting publication.

It is to be hoped that a good translation will place the book of Professor Silvestrini before the English-speaking medical public, for it would be a very useful addition to the still open field of studies on the spleen and its pathology and possible surgical future treatment. PAOLO DE VECCHI.

TRAITÉ PRATIQUE D'ORTHOPÉDIE, by D. G. POTEL, Professeur à la Faculté de Médicine de Lille. 8vo, pp. 734. G. Doin, Paris.

Professor Potel, of Lille, is well known as the author of surgical works, and the Traité Pratique d'Orthopédie, now under notice, has been foreshadowed by previously published studies. The author defines his subject as: "The Surgery of the Deformities of the Locomotive Apparatus," a title he would have preferred to that adopted, had it not been too long and unusual. We congratulate him on his conservatism for such a title, despite its length, is hardly comprehensive enough for a book which deals with deformities of the head and neck and upper extremities and spine. But for his reputation as a surgeon the reader of this work would suppose that Doctor Potel is a pathologist first and a surgeon afterwards, for he devotes far more space to the pathology than to the treatment of deformities. The practitioner who expects to find here a French equivalent to Jones and Lovett or Whitman, will be disappointed, but nevertheless we welcome this book, because there is plenty of room for such a work, and it is well that the facts of pathology, on which all sound theories of treatment are based, should be duly insisted upon. Rather more than half the work is devoted to malformations of congenital origin. In this Doctor Potel rightly insists on the small importance of disease and adhesions of the amnion on the causation of deformities and lays stress on the great part played by embryonic disorders, many of which are more or less hereditary. As regards congenital dislocation of the hip, he

adopts freely the theories of causation advocated by Dr. le Damany, which he considers to have been well established by that writer. Neither he nor Dr. le Damany, however, have explained satisfactorily the tremendous local variations in the frequency of this deformity. He would attribute congenital club-foot in almost all cases to muscular dystrophy, that is to say, to retarded development of the shortened muscles such as those of the sural group. As regards the pathology of non-cicatricial furrows, he confesses himself to be at a loss, but is clear that they are not of amniotic origin. The chapter on meningocele and similar defects is full and well illustrated with colored drawings. Little's disease and spastic hemiplegia are briefly dealt with and the author does not seem to be optimistic as to the results of any treatment.

The second part of the book, which deals with acquired malformations, is of a practical character, although in this also various methods of treatment are not fully detailed, but in justice to Doctor Potel it must be noted that in his preface he disclaims the intention to describe many methods, but only those that he has found the best. Arthritis deformans and the other conditions included under the term of rheumatoid arthritis receive very cursory notice, except in so far as they result in complete ankylosis, the treatment of which, by arthroplasty, etc., is dealt with at some length. The author appears to have no great opinion of the benefits to be expected from tendon transfer in the treatment either of the deformities following anterior poliomyelitis, or those secondary to injuries of peripheral nerves. No satisfactory exposition of the pathology of non-congenital pes cavus or claw-foot is offered. The last chapter on deformities caused by cicatrices after burns, etc., and their treatment by skin-grafting, is of practical value.

G. Muirhead Little.

Practical Surgery. By Dr. Victor Pauchet, Professeur a l'Ecole de Médicine d'Amiens. Translated by F. R. B. Atkinson, M.D., C.M., with an introduction by Sir Charles Gordon-Watson, C.M.G. Volume 1, 293 pages, Octavo. Volume 2, 252 Pages. London, Ernest Benn, Limited, 1924.

As the author says in his preface, these volumes are not a useless repetition of the existing treatises on operative surgery, but they are a series of articles on selected surgical subjects. A number of them are simply a description of the technic of various operations, but many are accompanied by a short and concise description of the symptoms of the disease and of the pre- and post-operative treatment. These are extremely practical, many are quite new and all of great value not only to the practicing surgeon, but also to students.

The author very modestly states that as his own procedures can not serve as models to his readers in all branches of surgery, he has asked some of his colleagues to republish methods they have practiced. Amongst these we find a really brilliant article on craniectomy by Thierry de Martel, one on cancer of the uterus by J. L. Faure and one on radium treatment of the same condition by H. Rubens-Duval.

These volumes contain more pages of illustrations than they do of reading matter. And a great deal of credit is due S. Dupret, the artist, and to the printers for the manner in which they are reproduced. They are all extremely clear, show every detail, and are of immense help to the reader as explanations of the text. A slight criticism that can be made is that the translation is too literal, which makes the English somewhat stilted and the style somewhat peculiar.

A point of great interest to American surgeons is that Pauchet uses no general anæsthesia. Practically all operations are carried out under local or spinal anæsthesia. It is to be regretted that the author recommends the use of buried unabsorbable sutures in hernia operations, and it would be well in future editions to correct the error made in the description of the anatomy of femoral hernia. It would, probably, also be better to substitute a description of one of the overlapping operations for ventral hernia rather than the suture by layer which the author describes. The article on cancer of the rectum is very valuable. It is very well written and accompanied by a great number of illustrations of the various operations done for its cure. It is very probable that Lane's disease is a hobby of Pauchet's. He calls it "the great disease" and says that from it, proceeds more than half pathology and that hepatic, gastric, thyroid, suprarenal, pancreatic, cardiac and breast affections can be caused by it. He recommends both medical and surgical treatment for this condition and is an ardent supporter of hemi and complete colectomy.

Pauchet is radical in the surgical treatment of gastric and duodenal ulcer. He says that 10 per cent. of these should be treated by gastro-enterostomy or pyloroplasty, 20 per cent. by thermo cauterization combined with one of the above operations and 70 per cent. should have a gastrectomy of greater or lesser extent. Here he repeats the importance of Lane's disease preceding and accompanying gastric and duodenal ulcer. He is an adherent of the theory that ulcer is the cause of cancer and states that three-quarters of all gastric cancers are preceded by ulcers. Instead of the posterior no loop gastro-enterostomy, he advocates the gastro-enterostomy in Y of Cesar Roux.

One cannot, however, read these volumes without feeling glad to have done so and amply repaid for the time spent in so doing. They should be very valuable reference books and will always aid in making many puzzling surgical points more intelligible.

J. P. Hoguet.

Surgical Pathology. By Joseph McFarland, M.D., Sc.D., Professor of Pathology in the Medical Department of the University of Pennsylvania. Octavo, 700 pages. Philadelphia, P. Blakiston's Son and Co., 1924.

In this book an attempt has been made to bring together and emphasize those aspects of pathology that are of particular interest and importance to surgeons. Unhampered by conventions the author has chosen for himself the subjects he would consider, the order in which they should be arranged

and the proportion of space assigned to each. A special effort has been made to arrange the matter in the book in logical order and sequence. Thus Part I, approximately one-third of the book, deals with congenital conditions of pathological and surgical interest. This leads up to an intelligent understanding of Part II which deals with tumors in the broad sense as well as considering, in more detail, the better understood and more simple tumors. Consequently very little is said about tumors in Part III. In the latter section special pathology is treated fully, most of the organs of the body being taken in order and individually considered. The author has emphasized those subjects which he feels are so necessary to the student and of which he himself has special knowledge. Particular emphasis is placed upon morbid conditions of the mammary gland.

As the author himself states, and it has been found true, he attempted to make the text interesting, profitable and readable. The greatest good will be obtained by more or less continuous reading, as one should have read what has gone before in order to grasp the full significance of what the author says. It is, therefore, less valuable as a book of reference on a particular subject than as a book to be read in continuity in order to gain a clearer and more general knowledge of surgical pathology.

Evidently with a feeling of the great importance of embryology in mind, the author has devoted what would ordinarily be an unusually large amount of space to morbid conditions depending upon embryologic malformation. Part I, devoted to these conditions, is possibly the most valuable and comprehensive part of the book.

It would have been desirable to have included in the book a somewhat fuller discussion of the special pathology of the ductless glands since so many valuable contributions have been made to this subject in recent years. There are only a few short paragraphs devoted to mixed tumors and dermoids of the pituitary gland. The thymus gland is not even mentioned.

A very complete bibliographic index is appended as well as a general index, and it is evident that the author has drawn freely from the best sources in pathology. The book is abundantly illustrated with a large number of diagrams, drawings and photographs both of gross and microscopic preparations; these naturally add greatly to the value and clearness of the text.

The book might be used for reference, but it is not primarily a full, comprehensive work as in the case of many other works on pathology. It is to be recommended particularly for the student and for the surgeon.

EMIL GOETSCH.

DISEASES OF THE BREAST. By WILLMOTT H. EVANS, M.D., F.R.C.S., Consulting Surgeon to the Royal Free Hospital. The University of London Press, Ltd., 1923. Octavo, pp. 490.

This single volume is an exhaustive study of the human breast, and its various diseases. The opening chapter describes briefly the essential points in the anatomy, embryology and physiology of the breast. The following

four chapters deal with the examination, bandaging, anomalies, atrophy, hypertrophy and hygiene of the nipple. This is an interesting section of the book containing many plates, showing the most extraordinary abnormalities.

Chapter six begins the portion which deals with the actual diseases of the breast. Fifty-seven various conditions are fully discussed and elaborately illustrated. The rarer diseases such as actinomycosis, sporotrichosis, hydatid cysts, osteoma and chondroma are given their place. The more common types of pathology are quite properly alloted more space. Seven chapters are devoted to carcinoma of the breast and its treatment. The operative technic which the author feels to be most effective for this disease is given in detail. He feels that the trend of the times is toward more radical procedures; that in the future the routine removal of the supra-clavicular glands may be done.

The chapter entitled "The Prognosis of Acinous Carcinoma" contains several tables of statistics which are very instructive. They show the reported results of several ancient as well as modern operators.

The final chapter considers diseases of the male breast, which it must be remembered may fall heir to exactly the same morbid conditions as are found in the female breast, though naturally much less frequently.

Considering the work as a whole, it is to be most highly recommended, not only for the general surgeon, but for the general practitioner, who is the one usually first consulted by the patient. It is his duty to recognize the various diseases to be familiar with the gross appearance of the pathology present, and to advise wisely as to the future disposition of the case.

The reviewer knows of no better treatise on the subject than the book under discussion. By examining the plates alone, a clear mental picture of many of the pathological conditions may be made. More works of this character will be welcome, works which are something more than text-books, still which are not beyond comprehension because of too great detail. Such books present in one volume all the necessary data for the diagnosis and treatment of the various diseases referable to that portion of the body under discussion.

MERRILL N. FOOTE.

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